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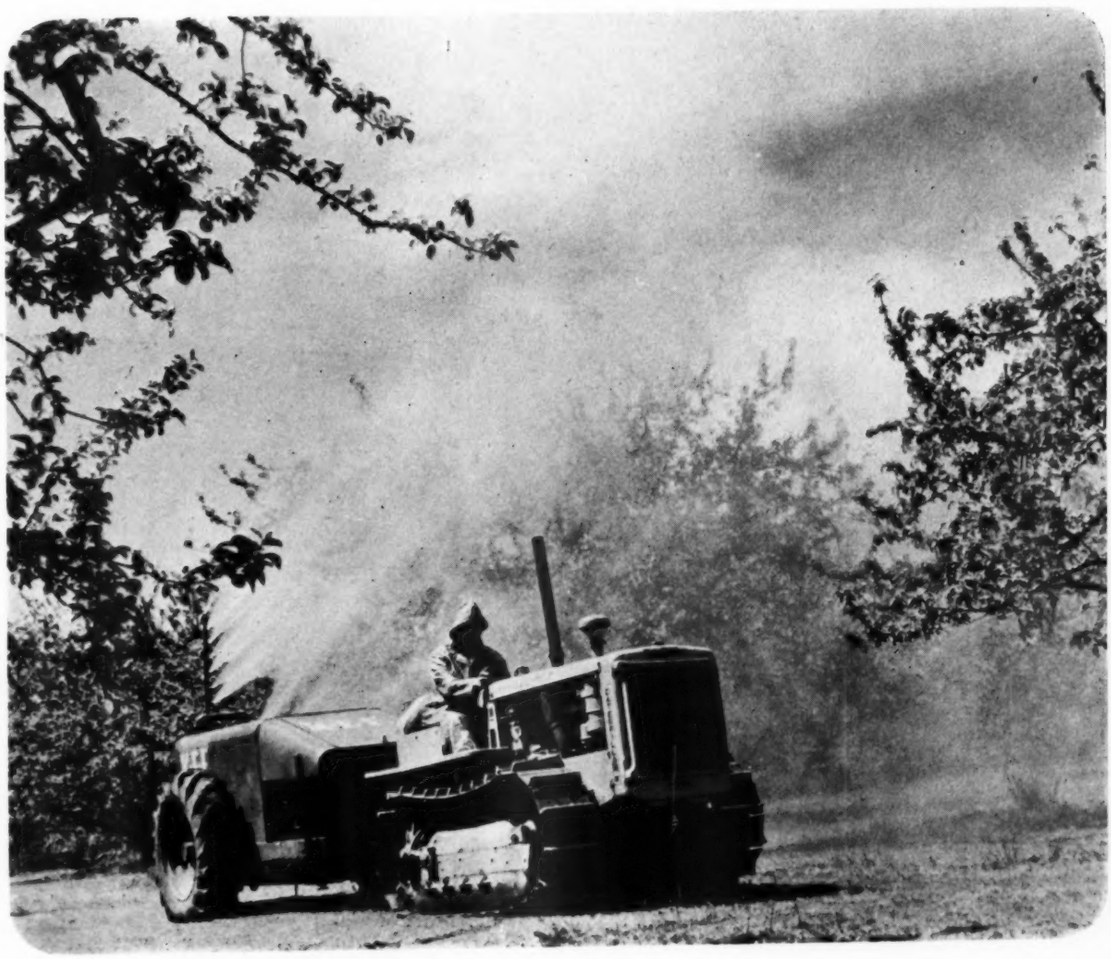

VOLUME 6, No. 12

DECEMBER 1954

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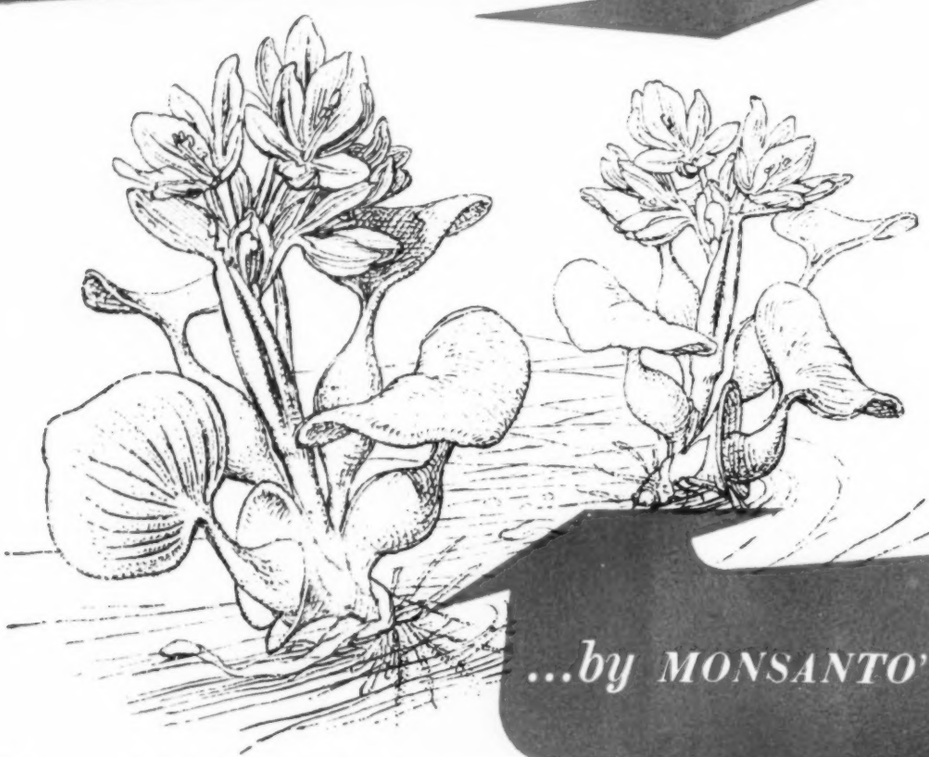

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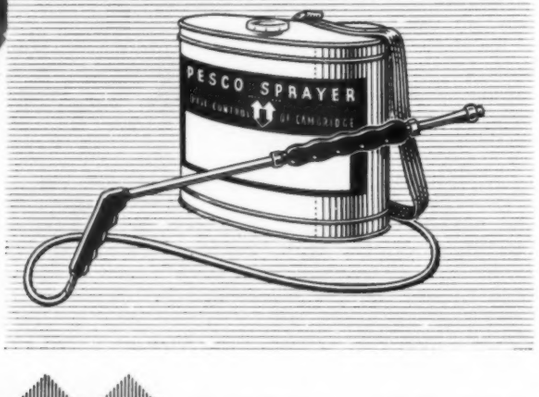

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Editorial Comment

Agricultural research in the tropics

NATIONALISTIC aspirations are occasioning unexpected difficulties in some tropical countries, in connection particularly with the carrying out of agricultural research, on which the prosperity of many countries is founded and on the continuation of which future well-being is largely contingent.

A case in point is the Sudan, where the cotton industry has been based almost entirely on research carried out by British scientists working under the condominium government.

The relinquishment by the British of its share of the control of government in this and some other tropical countries has given rise to a desire born of political motives to be rid of all forms of outside control as quickly as possible. This has included not only local administrative officers, but also the technical and research workers, local popular feeling holding that locally recruited officers are quite capable of replacing the imported product. Whatever may be the prospect of this eventually proving to be true, few informed people will credit that it is true at the present time, for, despite the fact that there are in many tropical countries an increasing number of technical officers of local origin who have received training in Britain, America or Europe, it is inconceivable that many or any of them will at present possess the necessary experience and matured judgment to enable them to plan, initiate and supervise research programmes.

Moreover, in such territories many British research workers are showing an increasing tendency to quit the service of the local governments because of not unreasonable fears regarding the security of tenure of their posts.

It seems, therefore, that there may be some danger in such countries of development and progress being slowed on account of the absence of adequate provision for research and investigation, and one wonders whether the answer may be found in the formation of companies in Britain or other countries which will contract to undertake special pieces of research or investigation on behalf of the governments of tropical countries. In the United States of America, there is more than one corporation which exists for the purpose of carrying out researches or investigations of different problems for private companies or organisations. The Batelle Memorial Institute, of which the director is Dr. K. Starr Chester, and of which an account appeared in WORLD CROPS, Vol. 3, p. 278, is a case in point. In Great Britain, investigations on certain problems in the control of pests and diseases or of manuring crops in overseas territories have already been undertaken by firms specialising in the supply and application of pesticide preparations or of chemical fertilisers, but so far no organisation like those in the U.S.A. has appeared whose business is entirely concerned with the carrying out of investigations on behalf of others. One is impelled to wonder whether as time elapses research development corporations will arise in Great Britain and some of the countries of Europe and provide an answer to this particular difficulty.

The reorganisation of the British Colonial Service

ON the other hand, the British Government has not been blind to the implications of some of the consequences of a situation which must be regarded as one largely of its own or, perhaps one should say, its predecessor's creation, as is shown by the issue of a White Paper, Colonial No. 306, under the above title.

On behalf of the Government, it was pointed out by Mr. Braine in the House of Commons in April last that, in view of the disappearance of the incomparable Indian Civil Service, of the fact that at that moment the Sudan Civil Service was crumbling before our eyes and that in the Gold Coast a decision had been reached to recruit no more administrative officers from Great Britain, it was realised that the fear of redundancy could not fail to affect recruitment for technical posts in the colonial dependencies. Since the war the Colonial Office has greatly increased its recruitment of technical and research officers, but the demand has outrun the supply. Apparently, the supply is still waning, while, as we have seen, the exodus from the service of technical officers goes on with increasing speed.

The remedy now proposed by the Government in the White Paper is the creation of an overseas civil service in which the interests of the officers concerned will be safeguarded by agreement with particular territorial governments. It is to be hoped that this plan will be successful, but meantime the suggestion in the previous comment of the possible formation of research development corporations might be a useful additional and not necessarily competitive alternative.

The FAO council meeting

INTEREST always attaches to the meetings of the FAO Council, the 20th session of which met in Rome on September 27. Proceedings at the earlier meetings were largely taken up with the Director's (Dr. P. V. Cardon) reviews of the present state of food and agriculture in the world and the current activities of FAO under the 1954-55 programmes. In the debates there have been discussions on the change in the position consequent on the manner in which food production has steadily overhauled population growth, while the problem of surpluses in several important commodities has also occupied attention.

The aim of the present policy of FAO is to endeavour to ensure that emphasis is laid on increasing production and consumption in the under-developed countries, where food shortages still continue to be a problem, but as the discussions developed it transpired that many countries found difficulty in approaching this question from the point of view of their own agriculture, the main problem being apparently that of

providing for heavier capital investment if such countries are to do their best. It was also pointed out that much of the recorded improvement in many countries must be attributed to the particularly favourable weather conditions encountered during the past two seasons.

In regard to the problem of surpluses, the Indian delegate, Mr. H. M. Patel, suggested that governments might be far too frightened by over-production, while it was apparent that many delegates held the view that the existing surpluses are not likely to increase and may even decline more rapidly than had been expected.

The more general view, however, was that, in any case, the approach to the problem of surpluses should be a global one, a view which seems to be obviously the correct one and is, in fact, tantamount to saying that a complete solution of the problem of world food supplies is, in fact, contingent on the solution of the problem of world exchange difficulties.

Fertilisers in Europe

A NEW statistical report from OEEC indicates that fertiliser usage in Europe—at any rate, in the OEEC member countries—continues to increase. The stand-still position that characterised 1951-52 seems to have passed; however, in that year certain countries adjusted or terminated fertiliser subsidy schemes, and no one knows how much farmers relied upon stocks to enable them to defer buying dearer fertilisers. The preliminary figures for 1952-53 reveal an overall rise of 7.5% in NPK usage, with most emphasis upon N, which shows an individual rise of 11.2%. Estimates for 1953-54 show a further overall rise of 6.3%, but here the emphasis is on phosphate with an individual increase of 9.1%. There is now no shortage of types of fertiliser capable of affecting the balance in demand for N, P or K. Perhaps none of these figures should be taken too literally. With 1952-53 tonnages assessed by preliminary returns and those for 1953-54 based upon official estimates, changes that are less than 10% in size may, in fact, be subject to quite sizable errors. All that should be confidently assumed is that the consumption trend is upward.

The best yardstick for measuring progress is pre-war usage. If reality confirms the 1953-54 estimates, total NPK consumption has now risen above the pre-war level by 66%; but for N, P and K separately this involves an 86% rise for N, a 50% rise for P and one of 75% for K. Belgium and Holland are still the outstandingly high users. Their rate of nutrient consumption per hectare is two and a half times that of the United Kingdom, four times that of France and more than six times that of Italy. In the industrialised countries of Europe, however, high fertiliser usage seems to reflect a shortage of agricultural land—the less land a country has, the more its farmers appreciate the productive virtues of fertilisers. Thus, Belgium and Holland together have only a third of the farmed acreage possessed by Britain and only about a seventh of the acreage of France.

A steady increase in the use of agricultural lime is most welcomely reported. The tentative figures for 1952-53 and 1953-54 show rises of 10% for each year, with particularly marked expansions in Austria, Denmark, France and Ireland.

Pesticides in tropical agriculture

AT a recent meeting of the pesticides subdivision of the American Chemical Society a symposium was held on the use of pesticides in tropical agriculture. In temperate regions in all the more advanced countries, the extension of the use of chemical insecticides, fungicides and herbicides is perhaps the most spectacular of the many advances of the last 10 years. So far this has by no means been paralleled in tropical countries, but increased interest in the possibilities of chemical control of pests, diseases and weeds is steadily manifesting itself, stimulated by the activities of international organisations such as FAO and the pesticide industry itself, which have done much to create wider interest in the use of pesticides in the overseas field.

It is probable that pesticide materials now available can provide the means of controlling most of the pests and diseases that are encountered in the tropics, while there seems every hope that for those for which remedies have not yet appeared or which have not yet been investigated remedies can be found as knowledge of them increases.

It is, however, essential that more and more accurate data should be made available on tropical conditions, and to obtain this the number of workers on the problems in the tropics themselves must be increased. This is not to belittle the considerable efforts that have been made already and the considerable numbers of research workers who are already available for work in the tropics, but having regard to the vastness of the tropical regions of the globe the number available is far from sufficient.

The present position

THE advances which have been achieved are probably greatest in the American tropics and sub-tropics, although there has also been progress in many British territories. The crops which have attracted the most attention and in which the greatest advances have been achieved are probably sugar cane and cotton. In relation to sugar cane, Mr. E. M. Summers, of the United Fruit Sugar Co. of Cuba, is reported to have estimated that at present in Cuba around some 5 to 6 million lb. of pesticide materials are annually used for the control of pests, diseases and weeds in sugar cane fields, while he places the maximum potential use of such materials at over 60 million lb.

Cotton is grown in the American tropic south of the U.S.A. on approximately 8,750,000 acres of land. The crop is particularly subject to the depredations of insect pests, and for their control approximately 44 million lb. of technical organic insecticides, such as DDT, BHC, toxaphene, aldrin, dieldrin and parathion, are imported, plus $3\frac{1}{2}$ million lb. of calcium arsenate.

Special interest attaches to the use of herbicides for the control of weeds and in many countries it is reported that chemical weedkillers have to a large extent replaced the hoe and the machete, especially in sugar cane fields: 2,4-D and its derivatives are the most popular chemicals, the amine salt being preferred because of its efficiency and ease of handling. Herbicides derived from tri chlor acetic acid (TCA) are also attaining popularity by reason of their effec-

tiveness against grasses which are not controllable by the hormone weedkillers, while chlorophenyl dimethyl urea (CMU) is reported to have shown promise. It seems probable that so far only the fringe of the advantages obtainable from the use of pesticides in tropical conditions has been touched. In any case, the bulk of the users occur among the larger plantations and estate properties. To the small cultivators—the native peasant proprietors who account for by far the largest part of the cultivation in tropical lands—the ability to use these new materials for the protection of their crops is at present largely denied, partly by reason of their cost and inaccessibility, partly by lack of suitable means of applying them, and partly by sheer ignorance of the benefits they can confer.

It is part of the great problem of raising the level of yields obtained by peasant cultivators to find means of informing them of the advantages which can be derived from the use of pesticides and of organising the means of supplying them on economic terms.

Farming in Japan

THE significance of agriculture to Japan has rarely been understood by the West. None of Japan's industrial progress has altered the fact that almost half the working population is engaged in farming. Four-fifths or more of the basic foodstuffs are home produced, and this is no minor achievement for a country only slightly larger than the United Kingdom with a population of nearly 90 million. For every five mouths to be fed in Britain there are nine in Japan, and the proportion of easily cultivated land is small. A very high input of labour compared with European standards and intensive methods of cultivation enabled Japan to minimise her imports of food before the war. Her population has risen by an estimated 14 million since 1940, *i.e.* about 20%, but there has been no similar-sized increase in Japan's dependence upon imported food. Productive though Japanese farming was before the war, it has become even more productive now. The highest level rice yields have been raised from 60 bushels per acre to between 80 and 120 bushels; potato production from 5 to 8 million tons a year; the cattle population from 1.65 million to more than 2.8 million. Land reclamation has played a notable part in this post-war expansion; in five years over 1 million acres of land and 10,000 acres of sea-covered land or marsh land have been added to the cultivated area. Unfortunately, Japan's austere economic position has restricted the capital available for the drainage and reclamation programme.

The standard of living in agricultural Japan is not inferior today to that in the industrial centres. Before the war it was said to be about 40% lower. As large a change as this must be looked upon as a very rapid social revolution; it may well account more than does any other factor for the increase in agricultural activity and output. If this is so, there is a moral that many other heavily populated countries in the world might profitably draw. Better seed varieties are being sown, fertilisers are being even more fully used, scientific farming literature is being widely read, but the people who are doing all this are leading a fuller life as well.

Antibiotics and plant diseases

SMALL-SCALE test experience with various antibiotics is building up a promising case for the commercial use of these substances. There is certainly no evidence that any antibiotic so far tested offers a wide range of control over fungus-type diseases, but some antibiotics seem to be scoring marked successes as specific fungicides. Actidione is effective against cherry leaf spot; streptomycin at very low rates is said to be better than any other fungicide in controlling tobacco blue mould. The principal research effort is taking place, of course, in the United States, where both the range and production of antibiotic substances is so much in advance of the rest of the world. Indeed, much of the small-scale testing has probably been fostered by producers who are looking ahead for market development.

There are two major difficulties to be overcome before there can be any substantial commercial usage of antibiotics as orchard or crop sprays. One is economic. There is a limit to the costs per acre that can be incurred for disease prevention. Can antibiotic formulations be cheap enough to keep below this limit? It is true enough that the production costs of some antibiotics have dropped staggeringly in the past six or seven years, but this applies mainly to those antibiotics that have established large medical markets. The lesser-known antibiotics are not as happily placed. If some of them could eventually find large markets in plant disease control, how long would it take for demand to reach a level that substantially lowered costs of production? The second difficulty is legal or administrative. It is most unlikely that permitted residue tolerances for antibiotics as crop sprays will be generous. There will be a natural apprehension that the medical effectiveness of antibiotics may be impaired if minute quantities regularly enter the human system as residues upon foodstuffs. The development of resistance to antibiotics is already well known; it may not apply to all antibiotics used in medicine, but it applies most seriously to some. The role of antibiotics in curing human diseases will always be given much greater priority than their role in controlling plant diseases; where there is any doubt, little or no freedom will be allowed for agricultural development. For these two reasons commercial development may prove to be much slower than the current research development.

IFAP

THE current fashion for identifying public bodies—and many other things, for that matter—by words made up of the initial letters of their titles in full is growing rapidly; in fact, it may be said to be a national habit which at times contributes greatly to the mystification of the general public. UNO, WHO and FAO are, of course, commonplace household words to everybody, but the one which stands at the heading of this paragraph may not as yet have attained such general recognition. Actually, it stands for the International Federation of Agricultural Producers and, although it is still comparatively young, it is really a very important organisation. It was constituted at a meeting held in 1947 in London. Since then meetings have been held in each succeeding year in Holland, France, Canada, Sweden,

Mexico, Rome and Kenya. The object of the federation is to provide a forum for farm leaders from all over the world, and, more particularly, to endeavour to harmonise the various national policies which at present hamper trade and give rise to alternations of boom and slump. At present, the farmers of 27 nations are represented in the association, while it is recognised by FAO, OEEC and other international bodies.

The organisation maintains a policy of favouring international commodity agreements to stabilise world trade in farm products. It would seem that, as a whole, world governments have accepted this policy in principle and to have agreed that it would constitute one good way of achieving stabilisation. But action has been slow and, as past president Martin warned the federation recently, economic nationalism is rising in the world. Domestic pressures in some countries have forced governments to increase trade barriers rather than reduce them, notwithstanding that in these self-same countries there have been numerous official and unofficial warnings that trade barriers must be lowered for the common good. IFAP has done, and is doing, its best to change this; it emphasises that government must be stirred to action at the national level before international action can be undertaken. International achievements, it maintains, ' may be harvested on the world scene, but they are seeded in every small town and village.' With all of which we can very cordially agree and wish IFAP all success in its self-appointed mission.

Cropping costs

A RECENT farm economics survey from Scotland—Report 41 from the North of Scotland College of Agriculture (M. A. Haughs and A. D. Imper)—shows how steadily and steeply the cropping costs of farming have risen since the end of the war. For oats the cost per acre in 1945 was £13 11s. 2d.; by 1949 this was nearly £19 an acre and by 1953 it had become £23 11s. 7d. For potatoes an acreage cost of just over £40 had risen to £76 in 1953. For turnips a 1945 cost of £25 9s. 3d. per acre had become £44 4s. 5d. in 1953. All these figures have been derived from assessing costs of cropping on numbers of farms over the years and the general trend of upward movement shown by the averages must be regarded as reasonably accurate. The cost rises from 1945 to 1953, if expressed as percentages for the three crops, are in plausible agreement, *e.g.* oats, 77%; potatoes, 90%; and turnips, 75%.

The implications for farming are clear enough; indeed, they might be said to be starkly clear. Crop prices have not risen as sharply and in some cases it can now be doubted whether present price levels can be maintained. The only way to solve the problem of narrowing margins between costs and returns is to raise the yield per acre, thus enabling more hundredweights of grain or more tons of roots to carry the acreage costs. This may, in fact, mean raising the costs: for example, a greater use of fertilisers might add between 5% and 10% to the acreage costs, but the proportionate return per acre would be higher and the margin between expenses and receipts widened. It is certainly not a sound solution to let the costs fall and in consequence have lower yields per acre; too many of the itemised costs per acre are fixed, hardly changing whether a poor or good crop is secured. Nevertheless, the extent to which total acreage costs have risen since 1945 is disturbing and it calls for no little courage from farmers—and considerable confidence in technical advice—to adopt a solution that involves raising the costs still further. Credit as well as courage will also be a determining factor.

Weather and surplus wheat

THE remarkably unpropitious weather experienced in the Northern Hemisphere this summer has had one unexpected result inasmuch as it bids to resolve the perplexities which were worrying the heads of international authorities in regard to the surplus stocks of wheat which were piling up on the American continent as the result of a succession of bumper harvests. In the United States, for example, the estimate of the wheat harvest at the beginning of October was 959 million bushels, compared with 1,169 million for the previous year, while in Canada the wheat crop has been even more dramatically reduced to 378 million bushels (the September estimate), as compared to 614 million last season. The present position is a dramatic reminder how the vagaries of the weather can completely change the supply position in regard to a world commodity and convert what threatened to be a burden round the neck of a world industry into a useful buffer supply. The changed situation has been reflected in the firm tone of the world's markets for wheat.

Commercialism in excelsis

RECENTLY we had occasion to seek permission from the authorities of Her Majesty's Stationery Office to reprint an article which had appeared in a semi-scientific journal issued under the authority of that office and which we believed would be of interest to our readers.

We had previously been informed by the department responsible for preparing the article in question that they had no objection to its reproduction, but that the permission of the Stationery Office was also needed. To our astonishment, when we applied to the Stationery Office we were informed that the desired permission would be granted provided due acknowledgment was made of the source and (the italics are ours) *a fee was paid to the Stationery Office before reproduction was made.*

This surely represents an excessively commercial attitude on the part of a Government department which, so far as our own experience goes, is not paralleled by other Government departments concerned with publications throughout the world.

Bearing in mind that often the circulation of papers appearing in Government publications is restricted and that on that account their reproduction in WORLD CROPS represents valuable additional publicity for scientific work of Government departments, which it may be added is paid for by the public, the decision in this case seems to us regrettable. We trust that we shall not see an extension of this practice in other directions.

The Possibilities of Increasing World Food Supplies—1

W. H. PAWLEY

Food and Agriculture Organisation

The possibilities of increasing world food supplies to keep pace with increasing world population is arousing world wide interest. The following examination of the possibilities was prepared by Mr. W. H. Pawley, of FAO, with the assistance of the heads of technical divisions of that organisation, for the recent World Population Conference. The paper is reproduced in slightly abbreviated form by permission of FAO. Part 2 will appear in our January issue.

IT is important to distinguish two issues in the tangled question of food and population, which has tantalised the world ever since Malthus placed it on the agenda.

The first is whether food production is likely to keep pace with population growth. Unfortunately, this query does not really admit of a scientific answer, since, in addition to the bounty of nature and man's technical ability to exploit it, economic, social, cultural and political factors play a major part. A more limited question is whether the extent of the usable land surface and the yields which the soil and the oceans are capable of giving can provide adequately for the much higher population already foreseeable, even if the best use be made of their potentialities. It may even be asked whether these resources, allied with current technological knowledge, could provide an optimum diet for the current population of 2.5 thousand million people. These problems can be tackled only if we know reasonably precisely where the main possibilities for increased production exist.

Policy implications

The assessment of resource potentials is obviously of importance for policy on the whole question of food and population. If the opportunities for expanding production are severely limited, a direct attack on the rate of population growth is clearly a matter of desperate urgency, since an extremely large increase in production would be needed to feed and clothe adequately even the present population of the world. If, on the other hand, unused potentials are very great, there is a clear call to the nations of the world to reconsider the adequacy of the effort that mankind is devoting to the investigation and development of those resources.

It could, indeed, be argued that the main approach may lie in a sufficiently rapid rise in living standards. History suggests that an increase in the food supply is almost invariably followed by a rapid increase in population. It also suggests, however, that all-round economic development results in opportunities for leisure and new concepts of living which create both the will and the understanding to adjust the family size to numbers which each family unit can support without unduly depressing its own standards of consumption and leisure.

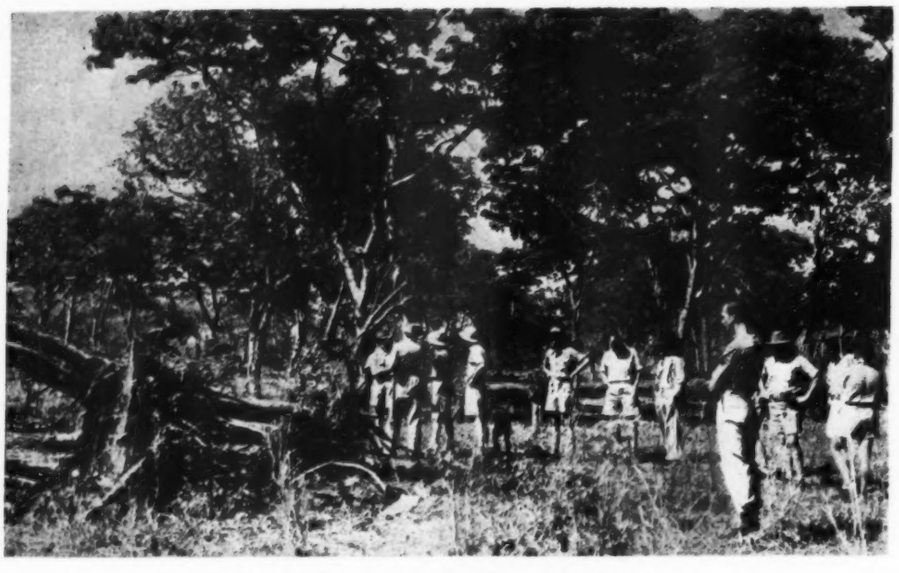
Possibilities for extending areas under cultivation

Although only a little over 1,000 million hectares, or about 10% of the land surface of the globe, is under cultivation, the opportunities for successful settlement by the individual pioneer are extremely limited. This has led to the belief that the limits of cultivable land have been reached; the correct conclusion is, however, rather that substantial areas of additional land can be brought under the plough only as a result of the co-ordinated efforts of governments, involving heavy investments and, in some regions, a great deal of research. In the long run, however, the opportunities for expansion of crop area are very substantial and an attempt will be made to indicate where the chief possibilities lie, while at the same time pointing out the principal problems to be faced in their development.

Equatorial lands

Despite plentiful rainfall and favourable temperatures for plant growth, the continuously hot and wet belt of tropical rain forest lying athwart the Equator presents the most conspicuous gap in a world map of sedentary agriculture. Apart from difficult living conditions, this is due, firstly, to the low natural fertility of the soil, which has been leached by the heavy rainfall and, secondly, to the difficulties of managing it so as to maintain the organic matter and avoid erosion once the forest has been

An irrigation canal (at high tide) by which land bordering the Amazon has been reclaimed for intensive cultivation



Bush clearing in Southern Rhodesia

cleared. It is not, therefore, surprising that mankind has been unable, except in areas with special advantages, such as Java, to establish a stable agriculture in ' these regions of lasting difficulty.'[1]

It would, however, be hardly conceivable that, with the resources of modern science, man will be unable to work out cropping patterns and methods of management which will enable him to build up and maintain soil fertility and so turn to good use this abundance of moisture and heat. For instance, it has been shown that tree crops, such as rubber, cocoa, oil palm and citrus, can be grown along with leguminous or other ground covers under conditions where sufficiently extensive areas of forest remain to exercise their beneficial influence on soil and climate. Where annual crops are grown, provision of shade and, in some soils, periodic reforestation or planting to leguminous shrubs may be necessary to replenish organic matter, as in the case of the ' corridor system ' in the Belgian Congo. In most cases, fairly heavy use of fertilisers will be called for, but there can be little doubt that much of the Equatorial region can be developed on the basis of careful soil surveys, agronomic research and thorough consideration of the potential uses for forests, pastures and crops. Kellogg and Salter have pointed out that utilisation of 20% of the unused tropical soils would add 1,000 million acres to the arable area.[2]

If this be true, an agricultural revolution comparable to the opening up of the grass and lightly timbered lands of the Americas and Australia lies somewhere ahead. In Indonesia, the great islands of Sumatra, Borneo and Celebes remain predominantly jungle. Differences in the fertility of the soil, although important, appear inadequate to explain the contrast with Java. Possibly more important is the fact that in these islands the rivers flood easily over large plains and require to be controlled at their headwaters before they can be turned to service, whereas in Java the river systems permit irrigation by people lacking modern engineering devices. It is probable that development over the continental land masses, such as the Congo and Amazon basins, will prove more difficult than in the islands of the East Indies. In Latin America, the vast eastern slopes of the Andes—a well-watered and for the most part temperate area—constitute the most immediately promising part of the Amazon basin and appear well suited to an economy based on tree crops and grass leys for livestock farming, given adequate transportation and use of fertilisers.

A wheat field in the Arrussi Province of Ethiopia. FAO has provided Ethiopia with an overall agricultural adviser and six other experts

The savannahs of Africa, America and Australia

In strong contrast to the situation in south-east Asia, which is climatically similar in many parts but has extensive areas of sedentary agriculture, the vast tropical savannahs of Africa, Latin America and northern Australia are used almost exclusively for extensive cattle grazing.

Here again, settlement is impeded by immense difficulties caused by excessive summer rainfall followed by a long dry season. Heavy precipitation often leaches the soil severely, while subsequent desiccation may result in a hard pan that impedes movement of water and root penetration. Quick growth causes the grasses to become tough early and the long dry season exhausts the cattle in their search for water and nutriment. A tremendous amount of patient experiment and large investments will be needed to render these lands productive, but a substantial proportion of the vast areas involved are undoubtedly destined for much more intensive exploitation, including mixed crop and animal husbandry, where moisture and soils are suitable.

In Africa, the higher rainfall areas of the Sudan cover a vast territory from the Atlantic to the Ethiopian plateau, where a wide range of summer crops, such as cotton, sorghums, maize, tobacco, groundnuts, other oilseeds and various legumes have been grown successfully.[3] Ethiopia is another area of undoubted great agricultural potentialities. In northern Australia, recent investigations have shown the feasibility of growing the usual summer

crops in certain soils of the broad Arnhem peninsula, which receives a rainfall ranging from 30 in. to 60 in., with five to six months of adequate moisture.[4] It is also believed that, by taking advantage of the natural flooding along certain of the rivers, perhaps 3 million acres could be brought under paddy cultivation. This would be a natural extension in the utilisation of the monsoon belt. The tropical grasslands of Brazil, which cover an enormous area to the south of the Amazon rain forest, are at present used almost exclusively for extensive cattle ranging, but with a rainfall ranging from 40 in. to 80 in. and a season of about six months of adequate moisture it would appear probable that a substantial part is destined ultimately to be used much more intensively for cereals and other crops, improved pastures and better breeds of cattle.

Desert near Tripoli. In the foreground, experiments in dune fixation under the supervision of an FAO forestry expert with *saccharum aegytiacum*. In the background, previous experiments accomplished in 1951-52 by private enterprise with various varieties of grass: the failure was due to an insufficient amount of material

The settled monsoon and savannah lands of Asia

The climatic similarities between this part of Asia and the alternately wet and dry regions of other continents tend to be concealed by the fact it is an area of old civilisations, dense populations and intensive agriculture. But, despite this intensive development, which is based principally on the widespread use of natural inundation, there are still great opportunities for increasing the area cropped annually through providing water for more double, and even triple, cropping.

At present, the greater part of the agricultural land has to be left idle half the year, although temperature conditions are favourable to year-round growth. At the same time, the region is characterised by an abundance of water resources, because of the torrential monsoon rains and because it is crossed by a large number of rivers descending from the snow-covered ranges of central Asia. In India, Ceylon and Thailand, only some 5% of the average annual run-off of the rivers is now being utilised; in Burma, less than 1%.[5] In India, for example, sufficient water exists to irrigate 260 million hectares, far in excess of the land area capable of being commanded. In east Pakistan, full development of the irrigation potential would make it possible to increase the area cropped annually by 50% to 75%.[6] A controlled water supply would also considerably increase average yields.

Despite intensive pressure on the land in many areas, there are other parts of this region with very substantial areas of potential arable land. Burma and Thailand, for instance, possess an abundance of land, and even in India millions of hectares have been left idle because of malaria or deep-rooted grasses which cannot be eradicated except by modern machinery. In Ceylon, an area approximately equal to that at present under cultivation awaits development in the dry zone, when research has shown how to overcome the many problems which have left it so sparsely settled.

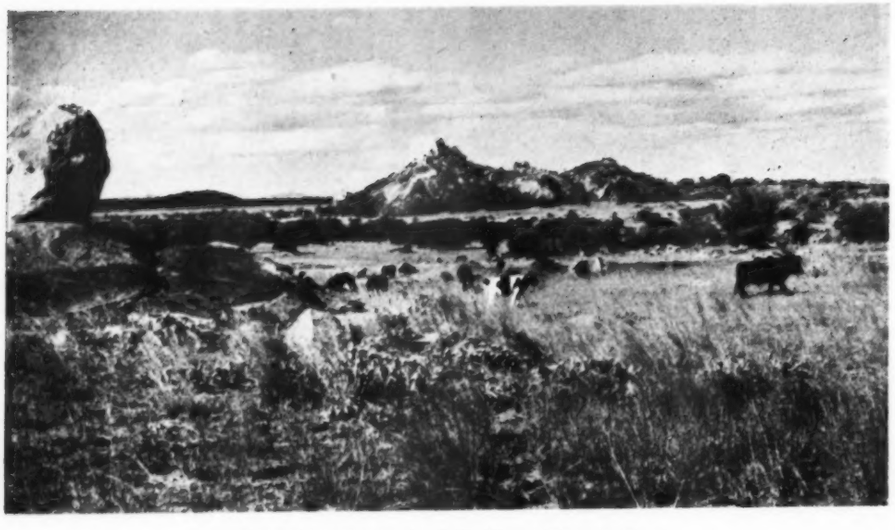
In contrast with other continents, the expansion of production in this region through irrigation raises few basic problems of land use. But the costs of large-scale irrigation and drainage are heavy. The limiting factor is not knowledge, but finance.

Irrigation in the arid and semi-arid lands

Deserts crossed by large rivers provided the stage for the earliest civilisations in the valleys of the Nile, the Tigris-Euphrates and the Indus. In these old irrigation areas, misuse of water and inadequate attention to drainage have put millions of acres out of use or reduced yields as a result of high water tables and/or salinity. There is no doubt that with proper methods these areas could be reclaimed. Furthermore, in India, Pakistan and Iraq the canal system usually supplies enough water to crop about one-third of the commandable area during any one season, so that a two- to threefold increase in the effective area could often be achieved by increasing the size and number of the canals.

In most of the newer regions, substantial opportunities still exist for bringing water to arid and semi-arid lands. In the U.S.A., the Bureau of Reclamation reports that water is available for an additional 6 million hectares.[7] A partial indication of the potentialities for irrigation in Latin America

Edges of thatch grass planted to fix dunes in a mountain area of Tripolitania



Grazing lands in Southern Rhodesia

is given by the fact that irrigation projects considered by the various technical authorities exceed 5 million hectares. In Africa, ' the flat irrigable area of the Middle Niger is very much greater than the Nile lands of Egypt.'[8] Many other substantial opportunities for irrigation exist on this continent. Extremely large potentials for irrigation of desert soils exist in the U.S.S.R. Projects at present under construction will benefit about 8 million hectares, while the immense Ob-Yenisei scheme proposes to divert about 12½% of the water that flows to waste in the Arctic Ocean to irrigate 25 million hectares of the steppes and desert of central Asia. Substantial possibilities for irrigation of desert areas, running into several millions of hectares, exist also in northern China, principally from the waters of the Yellow River.

Although the total area of arid land which can be irrigated is small relatively to the areas of potential farm land in the tropics, one must remember that yields under irrigation are high and assured. The problems involved are also small compared with the problems to be faced in either the continuously wet or the alternately wet and dry tropics. Perhaps the principal requirements to ensure permanent exploitation is to apply the lessons learned in the Indus and Tigris-Euphrates valleys by ensuring adequate drainage and enough water use to wash downwards the salts which the water brings with it.

The well-watered temperate lands

Contrary to general belief, by no means all the good rainfall country in the temperate zones has been brought under the plough, although opportunities in the Northern Hemisphere are very limited indeed. In the Southern Hemisphere, two major zones exist where climatic and topographic conditions well suited to agriculture have remained extensive grazing areas, because low population has been associated with land tenure and cultural traditions which militated against cultivation, or with natural deficiencies in the soil, which, although they can be overcome, have presented an initial obstacle. These conditions are found in parts of southern Australia and in the lands to the north of the la Plata delta in Uruguay and southern Brazil.

In Australia, it is now known that most of the good rainfall country, passed over by the pioneers as infertile, can be rendered productive by the addition of trace elements and the growth of leguminous plants to raise the nitrogen and organic content of the soils and brought under a system of mixed farming instead of the present extensive sheep grazing. It has been estimated that about 160 million acres of well-watered land in southern Australia await such improvement compared with about 40 million acres now under cropping or improved pastures.[9]

The southernmost extension of Brazil, with 40 in. to 50 in. of rainfall well distributed throughout the year and excellent soils, is considered by James to be fitted for a ' farming system not unlike that of parts of the North American corn belt '[10] rather than their present mainly pastoral use. In Uruguay, as in southern Brazil, the tenure system and absence of population pressure have resulted in the persistence of an almost purely pastoral economy on land apparently well suited for much more intensive use.

The northern podzols

Kellogg and Salter have drawn attention to the podzol zone, principally in the U.S.S.R. and to a lesser extent in Canada, as a potential area for extending cultivation. On the analogy of Scandinavian and Finnish experience, they consider that some 10% of these soils, amounting to about 300 million acres, might ultimately be used.[2] In Canada, the reserve of arable land has been estimated at about 18 million hectares or approximately half the area now under cultivation. It is also thought that the area which could be utilised for permanent pastures is about 40 million hectares, as against 22 million hectares so used at present.

In the final analysis, it is improbable that extension northwards of the frontier of cultivation will offer to the world any large proportion of the benefit to be gained by bringing the tropics under domination, since the environmental conditions for growth in the high latitudes are much less favourable. However, with the development of mixed farming based upon adapted cereals, forage crops and a dairy industry, and with the use of substantial amounts of lime and mineral fertilisers, the podzol region can be expected to give a fairly large production of those crops and animal products for which the abundant potential resources of the tropics are less suited.

The references will be published next month.

Photos: Pp. 481, 482 (*bottom*) *and* 483 (*bottom*), *United Nations, London. Pp.* 482 (*top*) *and* 484, *Southern Rhodesian Government. P.* 483 (*top*) *FAO.*

British Ploughing Grants for Grassland

Farmers in England are reminded that the Ploughing Grants Scheme, 1954, continues ploughing grants until May 31, 1955. The conditions attaching to the standard rate of grant of £5 per acre for ploughing up grassland of at least three years' standing, and to the special high rate of £10 per acre for ploughing up difficult pre-war grassland, are unchanged.

Applicants for a grant of £5 per acre should give County Agricultural Executive Committees the following information within 21 days of ploughing up eligible land:

(*a*) Name of holding and parish where situated.
(*b*) Field O.S. number.
(*c*) Date ploughed.

They should not reseed to grass, or to grass and another crop for grazing, without getting the committee's prior approval; and if they wish to fallow the land during the summer of 1955 they should ask for approval before they plough.

Applicants for a grant of £10 per acre should consult the Agricultural Executive Committee before any work is started.

The Development of Spraying Machinery

Part 2—Spraying Machine Performance

R. J. COURSHEE, B.Sc.

This is part 2 of Mr. Courshee's article on spraying machinery, the first part of which appeared in our November issue. It deals with the measurement of spraying machine performance. Part 3, which discusses the development of new machines, will appear in our January issue.

THE previous article considered the definition of what is required from a spraying machine, *i.e.* that it distributes chemicals economically and functions reliably. Methods of measuring whether or not it is performing properly are considered in this article.

There are two ways of working on the problem of producing spraying machines. The first, which is very successful (but mainly in the application of large volumes, some hundreds of gallons per acre, of dilute solution of a chemical) is to go directly for the answer: Does this machine applying this chemical control the pest? The second, which I feel may provide better answers and in the long run will almost certainly give them quicker, is to break the subject down into its component parts: (1) The pest is studied and a time and method of chemical control defined. (2) The dose required is assessed by measuring the relationship between dose (quantity and form) and control (the dosage response curve) and by estimating the degree of limitation of the infestation (*i.e.* not 100% control usually) which is desirable.* (3) Make a machine to apply this. (4) Do a yield test of the method using the chosen machine and chemical first under research conditions and then under the most rigorous practical conditions possible. This last is a critical appraisement of all of the three preliminary stages and of the practical suitability of the machine; any failure of the combination should be studied in order to attribute the blame to one or other of them.

We have little quantitative evidence of the validity of techniques designed and used to measure mechanical reliability and so I shall not discuss these. What follows concerns the measurement of the distribution of chemicals and is more generally applicable to rates not exceeding a few milligrammes of solution per square centimetre.

Dose estimation

Since the dose on a leaf determines what happens, it is ideal to measure it there, but more convenient and quick to measure it on other surfaces. The relationship of the dose on these to that on the leaves can be measured, but a short cut may be made by relating the dose on the artificial receiving surfaces to what happens to the pest. The danger in making this abbreviation is that the relationship will be different under different circumstances.

For example, a dose is often measured on horizontal surfaces on the ground in bare areas between crop plants. The comparison between what lands on these surfaces and what controls, for example, colorado beetle on potatoes is very different in the case of newly emerged and for nearly fully-grown plants. This looks rather a trite comment, but, on the one hand, some people ignore such differences, while others assume that people who make spraying machines also ignore them.

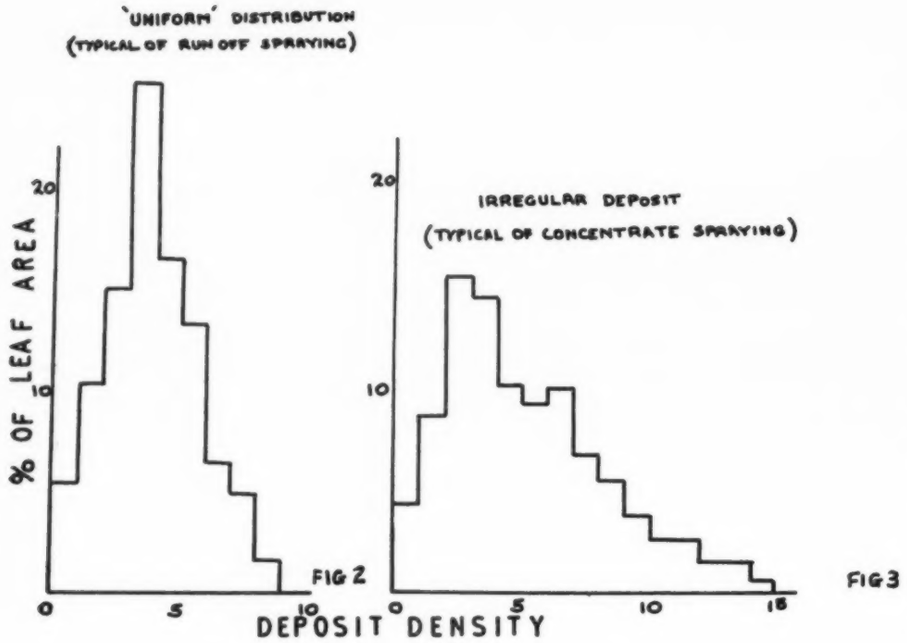
Methods

A method which appears suitable for many purposes is to clip a folded slip of thin celluloid coated with a standard film, so that it enfolds a leaf (Fig. 1). The impaction on this smooth surface is, particularly for small drops, less than that on a rough leaf surface. Additionally, the retention of spray once landed and the movement of the leaf in the stream of air carrying the spray will also differ. However, if deposit measurements are made on slides on some

Fig. 1. Celluloid clipped to a leaf. A length of orange rug wool hanging nearby acts as a marker to help locate the slides

*The machine performance is designed around (1) the relationship between toxic deposit and insect activity (the dosage response curve) and (2) the relationship between insect activity and economic or absolute yield (the pathometric curve).

It is desirable, when considering spraying machinery, to join these together to obtain the relationship between deposit and change in net economic yield, for the latter determines whether or not either chemicals or a spraying machine can be bought, what quantities of chemicals can be used and what form the machine can take.



Figs. 2 and 3. Spray deposits in apple trees

leaves at the same time as biological measurements are made on others, a suitable dose on the celluloid can be ascertained. The machine then has a target to provide this proper dose on the celluloid-covered leaves.

Limitations

Speed in measuring the quantity on unit area is essential in view of the large number of measurements required to obtain an accurate average result and gravimetric analysis is usually unsuitably slow. If a tracer dye is added to the spray, the dose may be measured with a colorimeter; the dye on an area is dissolved in a given volume of solvent and the concentration of the resulting solution, *i.e.* the quantity of spray, measured. Occasionally, as when spraying DNC, the chemical itself is coloured and may be measured with a colorimeter. Often the spray chemical can be measured by titration using standard methods of volumetric analysis. A two-man team can measure a few hundred samples daily and so determine in a day whether or not a machine is playing its part, whereas biological measurements may need to continue through a whole season.

Using more spray than is necessary is wasteful in proportion to the excess and is, on some occasions, likely to cause damage. Sub-lethal doses lead to a deficiency in control and possibly to the development of resistant strains of pests.

Non-uniformity of the dose is responsible for a much higher consumption of chemicals than necessary and reduction of the variation in dose in different parts of the crop is a primary aim of work on spraying machines. Consider the example of spraying apple trees. We find that different trees receive closely similar doses and different parts of the same tree receive quantities which do not differ by much more than a factor two (that is, there is often half as much per unit area in the top as there is in the bottom). On the other hand, of two leaves lying quite near each other, one may receive up to 100 times as much as its neighbour, receiving perhaps as little as 10 microgrammes per square centimetre. (This latter dose is equivalent roughly to one 100-micron drop on each few square millimetres.) If, as is true occasionally, this small dose is sufficient, 99% of the quantity arriving on the other leaf is waste.

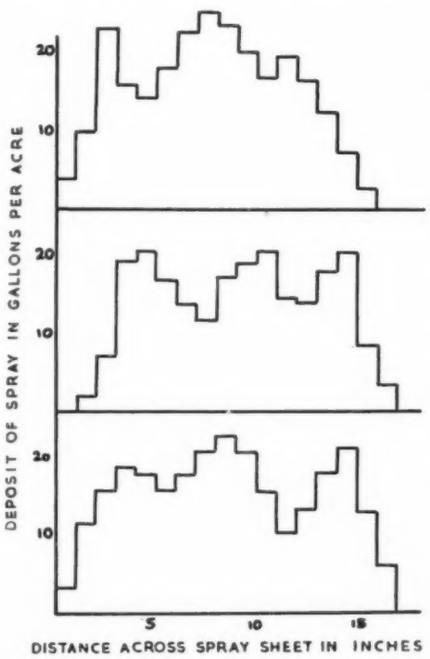


Fig. 4. Spray nozzle distributions of three normally similar and new nozzles

A plot is shown in Fig. 3 of a typical set of measurements on a few hundred leaves taken from all parts of apple trees. A result obtained with a machine which applies a more uniform (and less wasteful) deposit is shown in Fig. 2.

The point is that these chemicals cost a lot of money and, although some waste is inevitable, it rarely need be as great as it often is at present.

Nozzle distributions

Similar considerations apply to a row of nozzles on the boom of a ground crop sprayer. Each nozzle which has worn and is emitting more spray than it should is wasting an expensive commodity. Each nozzle sprays a strip perhaps 18 in. wide and we presume that for many crops it is desirable to apply the same quantity of chemical to each part of the strip.

Nozzles, even new ones, usually do not give their rated output and frequently give widely differing deposits in various parts of their patterns (Fig. 4). Whether or not this irregularity matters is only a matter of cost. A uniform deposit could be had at a price and whether or not it is worth while to go to the expense of fitting nozzles to give a uniform deposit depends, firstly, upon whether this is, in fact, desirable; secondly, upon how large and expensive the present irregularity is; and thirdly, on how much it would cost to rectify it.

It may be pointed out, however, that the best machine to buy is the best one for the job (unless a very cheap sprayer is bought for a very small acreage). Consider the example of a sprayer working hard (say, 600 hours a year spraying 6,000-acre applications). This is, of course, a big machine with a lot of work to do, though some have to spray 24,000-acre applications a year. The cost of materials for 6,000 acres is unlikely to be less than £3,000 and is probably more. Sprayers, depending upon the materials, wear out their nozzle tips about 12 times in a 600-hour season and new discs for a 20-nozzle boom would cost about £20. If, however, an 'economy' were made and discs were replaced less often (say, once every 100 hours, thus saving £10), then the consumption of spray chemicals (at a fixed forward speed) is likely to be excessive by an amount in the region of a few per cent.—say 5%, which on £3,000 is £150, giving a net profit on the economy of minus £140.

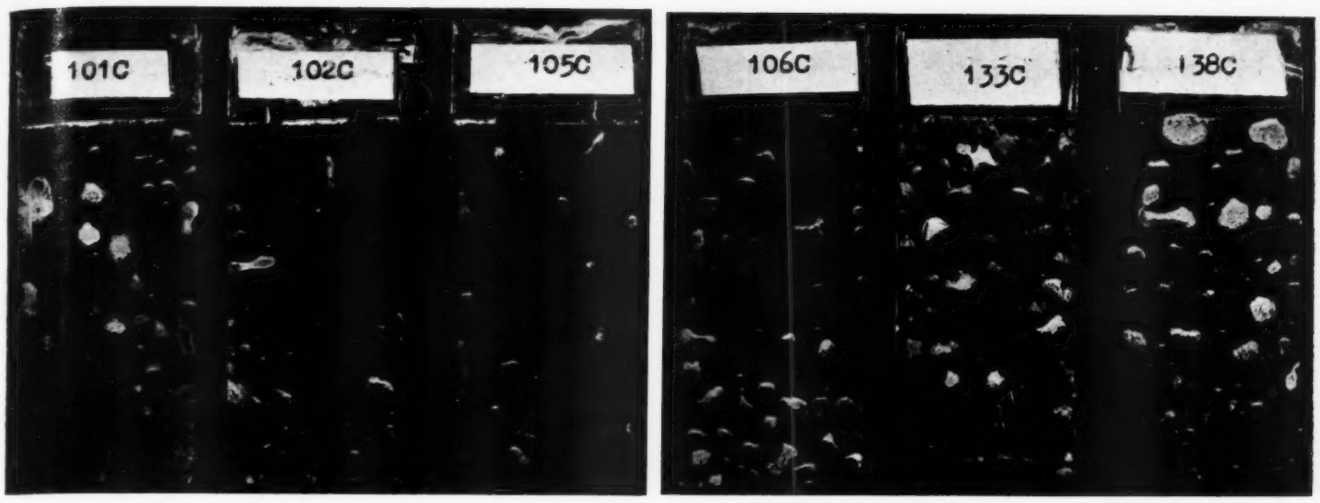


Fig. 5. Examples of low-volume spray deposits on celluloid slide. (Mag. × 1.5.) These appear to show similar types of distribution of spray to those seen on the actual leaves in the illustration to the previous article in this series

Equally, a speedometer is an essential piece of equipment on any sprayer on which the application rate is fixed by the speed of travel.

It is possible that part of the many controversies as to whether, for example, you need 10 or 20 oz. of MCPA per acre against a certain weed may be resolvable in that 10 oz. applied uniformly with one sprayer may have the same effect as 20 oz. applied irregularly with another.

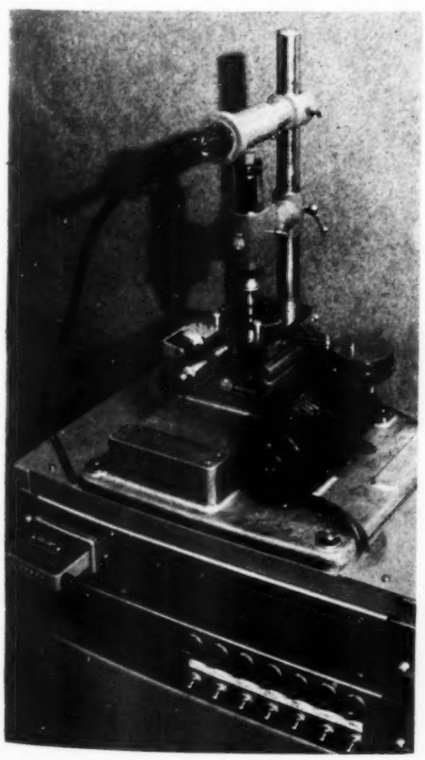
The fine structure of the dose

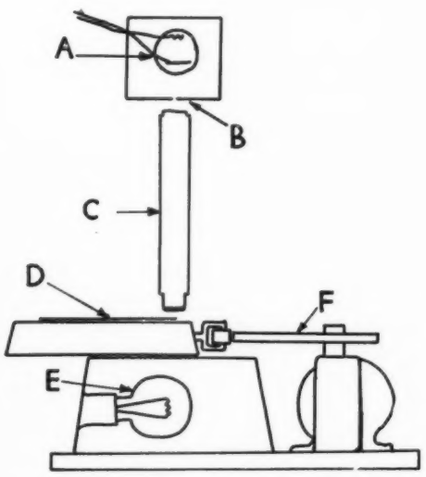
Some actual spray deposits illustrating applications of active material applied in drops of different sizes and as solutions of different concentrations are shown in Fig. 5. What happens to a bug is determined, firstly, by the total quantity of spray per unit area and, secondly, by the two factors cover and gap size between spray stains and, although spray pictures give a useful qualitative impression of the sort of cover obtained, numerical measurements are much more valuable. It is a slow, laborious task to make such measurements by eye and since a large number of spray pictures need to be turned into figures it is necessary to do the work quickly. For this purpose a machine has been devised by L. K. Wheeler, of the Post Office Engineering Research Station, and E. S. Trickett, of the N.I.A.E.

With certain modifications to the original, this machine (Figs. 6a and b) enabled us to take the sprayed celluloid strips from the leaves, place them in the machine and, from the figures recorded on rows of counters, to assess the fineness and completeness of the cover.

To do this the opaque spray pattern on the transparent slide is oscillated to and fro in front of a tiny illuminated hole; each blockage of the light beam by each particle of every spray stain is noted and recorded by the analyser.

The scope for this device is only just beginning to be appreciated. We have used it for measuring the performance of machines, but its most worthwhile use will be measuring the properties of spray deposits which do control diseases and thereby providing chemists and engineers with the knowledge of what is required to achieve a control. Once the objective which a suitable spraying machine should achieve has been defined it should become possible to distinguish between the merits of alternative types of machines and also to try to make machines which are both efficient and economic in applying chemicals.





(*a*) Photocell, (*b*) aperture on which magnified image of the spray stains is projected, (*c*) microscope, (*d*) sprayed slide clamped to oscillating stage, (*e*) light, (*f*) motor driver cam.

(*Left*) **Fig. 6** (*a*). **Spray deposit scanner. To measure dose, cover and drop size the sprayed celluloid slide is clamped to the top of an oscillating stage.** (*Above*) **Fig. 6** (*b*). **Schematic diagram of the scanner to illustrate the working principle**

Photos: National Institute of Agricultural Engineering.

Fire Cements Leaflet

We have received from J. H. Sankey and Son Ltd., of Ilford, Essex, a copy of the company's latest leaflet. It gives full details of its Pyruma and Aluma fire cements and Siluma patching cement. A free copy of this leaflet is obtainable from the company.

Field Experience with Spray Nozzles in the Tropics

F. L. VANDERPLANK, Ph.D.

Entomologist in charge of Coconut Pest Research, Zanzibar

In this article, the author gives some results of experiments with various types of spray nozzles on tropical crops in Zanzibar.

R. J. COURSHEE, in his article on spray nozzles in the August 1953 number of WORLD CROPS, gives a review of some of the several types of spray nozzles in use, but he does not indicate the droplet spectra, nor the particular values of any of these nozzles. Although Mr. Courshee considers that the spinning disc type is only necessary in exceptional circumstances, I have found that this type is far superior to any others which I have tested.

Types of sprayer used

During the past year I have been using the following four types of sprayers to test various types of insecticidal formulations on a variety of insect pests:

1. *Hand sprayer. The 'Eclipse' pneumatic knapsack sprayer*, working at a pressure of 20 to 40 p.s.i., with a swirling type nozzle, producing a mist at an output of about 2 gal. an hour. The droplet size varies from 20 to 500 microns, the majority of droplets being in the region of 100 to 200 microns.

2. *Machine pressure hand sprayer*, working at a pressure of 100 to 120 p.s.i., with a swirling type of nozzle, producing a fine spray, or a coarse mist, at an output of about 25 gal. an hour. The droplet size varies from 50 to 1,000 microns, the majority of droplets being in the region of 200 to 500 microns. The same machine can be used as a boom sprayer with fan type nozzles giving coarse droplets.

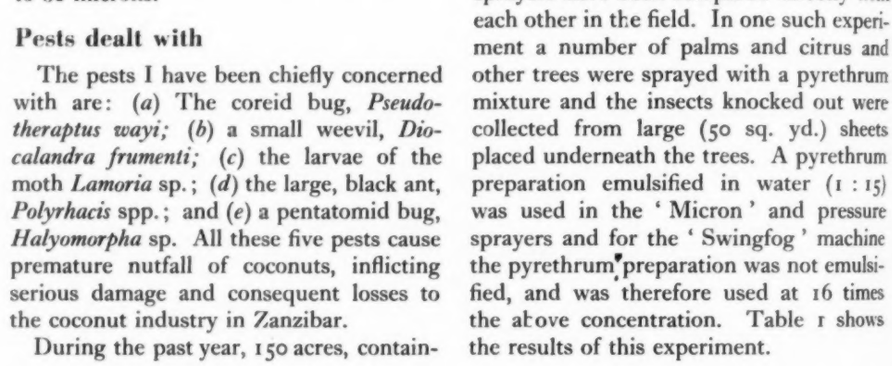
3. *'Swingfog' machine.* This has already been quite extensively described in several articles in WORLD CROPS. Its output is about 1½ gal. an hour and it produces a fog with droplets from 5 to about 30 microns, but the majority are under 10 microns. A new regulator is available for this machine and the droplet size can be increased up to 50 or 60 microns. When this is done the output is raised to 6 gal. an hour.

4. *Micron Sprayers Standard 'Micron' sprayer.* (*a*) With the standing spinning disc atomiser giving a droplet spectrum between 20 to 400 microns, with a majority of droplets in the region of 90 to 150 microns, and an output of about 20 gal. an hour. (*b*) With a new type of atomiser, similar to that used in the 'Mini-Micron.' This head gives a very much finer droplet spectrum, varying from 10 to 150 microns, the majority of droplets being between 50 to 80 microns.

Pests dealt with

The pests I have been chiefly concerned with are: (*a*) The coreid bug, *Pseudotheraptus wayi;* (*b*) a small weevil, *Diocalandra frumenti;* (*c*) the larvae of the moth *Lamoria* sp.; (*d*) the large, black ant, *Polyrhacis* spp.; and (*e*) a pentatomid bug, *Halyomorpha* sp. All these five pests cause premature nutfall of coconuts, inflicting serious damage and consequent losses to the coconut industry in Zanzibar.

During the past year, 150 acres, containing approximately 7,500 palms, have been sprayed by hand, using the 'Eclipse' pneumatic knapsack coconut sprayers; 250 acres, containing approximately 12,500 palms, have been sprayed with the 'Micron' sprayer, and a further 1,000 acres have been sprayed with the use of aircraft. So far the 'Swingfog' machine and the machine pressure hand sprayer have only been used experimentally on a small number of palms. However, these four types of sprayers have been compared directly with each other in the field. In one such experiment a number of palms and citrus and other trees were sprayed with a pyrethrum mixture and the insects knocked out were collected from large (50 sq. yd.) sheets placed underneath the trees. A pyrethrum preparation emulsified in water (1 : 15) was used in the 'Micron' and pressure sprayers and for the 'Swingfog' machine the pyrethrum preparation was not emulsified, and was therefore used at 16 times the above concentration. Table 1 shows the results of this experiment.



Drift mist spraying a 60-ft. coconut palm using a 'Micron' sprayer

TABLE 1

Pyrethrum emulsion (pyrethrum in oil for 'Swingfog' machine). Number of insects, excluding ants, collected from similar palms or trees up to two hours after spraying.

Machine	*Average dosage per tree, gallons*	*Average per tree*		
		Five citrus trees	*Ten palms*	*Two* Albizzia *sp.*
'Micron' sprayer	1	596	628	1,450
Pressure sprayer	20	285	343	589
'Swingfog' machine	¼*	84	57	167

* This is equivalent to 4 gal. of emulsion.

Table 2 gives the number of insects collected per gallon of emulsion or, in the case of the 'Swingfog' machine, the equivalent amount:

TABLE 2
AVERAGE NUMBER OF INSECTS PER GALLON OF EMULSION

'Micron' sprayer	891
Pressure sprayer	20
'Swingfog' machine	24

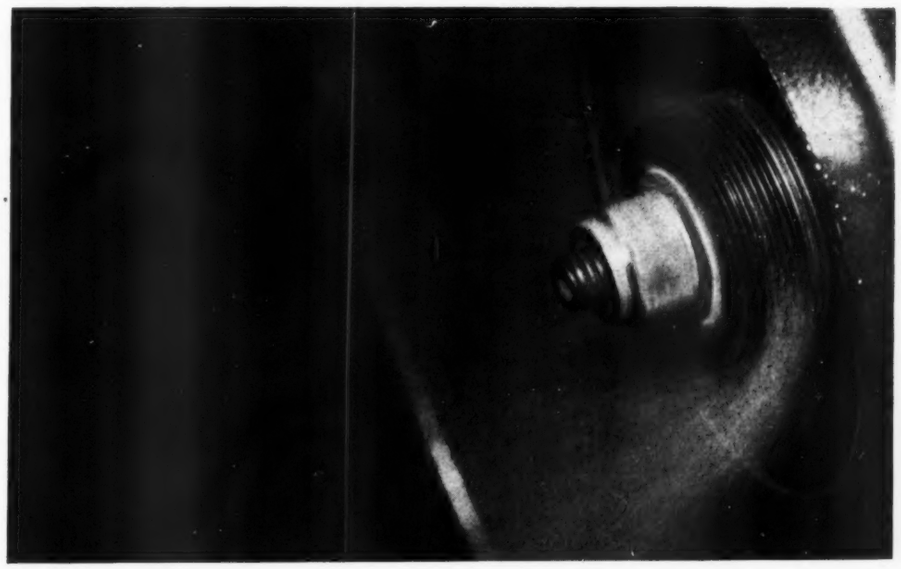
Discussion

It will be seen from the above table that the 'Micron' sprayer knocked down 44 times more insects than either of the other two types of machine. The reasons for this are that the 'Micron' sprayer puts out a large number of droplets, each of which is lethal to the majority of insects, and these are carried in a powerful blast of air right into the tree or crown of the palm. With the pressure sprayer it was necessary to use ladders and to spray upwards and downwards in order to wet both sides of the leaves. This is slow and rather laborious, since the spray from an ordinary nozzle does not carry more than a few feet. With the 'Micron' sprayer, however, the droplets can be blasted into the tree for a distance of more than 30 ft. With the 'Swingfog' machine the whole tree or the crown of the palm was kept in an insecticidal fog for five minutes, but the droplets were so fine that they failed to settle in sufficient quantities on the larger insects and so were ineffective. They were, however, very effective against small flying insects, which pick up the droplets on their antennae and wings during flight. When the new type of regulator for the 'Swingfog' machine was used the droplets became very much more effective, but as they were larger they did not carry any further than droplets from the ordinary type of spray nozzle.

The droplet spectrum

The droplet spectrum varies with the type of solvent or carrier used in the insecticide. Insecticides dissolved in oil solvents generally give smaller droplets than emulsions, wettable powders or suspensions in water. The spinning disc type of nozzle gives a very much narrower droplet spectrum than any other, even when a greater flow of liquid is used than is required to give the optimal droplet spectrum. Table 3 shows the droplet range with the new 'Micron' atomiser and various insecticidal formulations.

Table 4 shows the average droplet size and the number of droplets per sq. in. obtained at different heights from the ground in a coconut plantation sprayed at ½ gal. an acre of 10% DDT plus 1% Epok Indene resin, grade C469, dissolved in 50% kerosene and 50% diesoline. This formulation in this dosage has been found highly effective against all the pests involved in this particular problem and when sprayed through the 'Micron' sprayer does no damage to even the most sensitive foliage, nor does it adversely affect the beneficial insects, such as the red tree ant (*Oecophylla* sp.), honey bees (*Apis* sp.) and



High-speed flash photograph of the new 'Micron' atomiser in action (actual size)

TABLE 3
NEW ATOMISER FOR STANDARD 'MICRON' SPRAYER
(Plates 45 ft. from nozzle; rate 100 c.c. per minute)

Corrected droplet size, microns	*Percentage of droplets by numbers*						
	With 10*DRDK*	*No.* 1	*No.* 2	*No.* 3	*No.* 4	*No.* 5	*No.* 6
0—8.5 ..	0.5	0.0	7.6	0.5	23.9	0.6	7.5
—17.0 ..	2.1	0.6	14.6	5.6	27.2	2.6	8.4
—25.5 ..	6.2	1.7	11.5	8.7	18.5	6.4	15.9
—34.0 ..	17.0	7.3	21.7	19.4	12.0	12.2	19.6
—42.5 ..	15.0	9.5	17.2	21.4	8.7	15.4	12.1
—51.0 ..	17.5	21.8	11.5	19.9	3.3	17.9	9.3
—59.5 ..	14.0	11.2	7.0	9.9	2.2	16.0	5.6
—68.0 ..	7.7	12.3	5.7	10.2	1.1	10.2	5.6
—76.5 ..	6.2	12.3	1.3	4.1	1.1	7.1	5.6
—85.0 ..	7.7	9.5	1.9	2.0	1.1	5.8	3.7
—93.5 ..	2.6	6.1	0.0	0.0	0.0	1.9	2.8
—102.0 ..	1.5	3.4	0.0	0.0	0.0	1.2	0.9
—110.5 ..	1.0	1.1	0.0	0.0	1.1	0.6	0.0
Over 111.0 ..	1.0	3.4	0.0	0.0	0.0	1.9	2.8
Mean	54.2	64.7	37.2	46.2	25.7	54.7	44.0

No. 1: Water with detergent plus a red dye.
No. 2: Formula 40D 4RCX (40% DDT solution).
No. 3: Formula 40D 4ROX (40% DDT solution).
No. 4: Xylene plus red dye only.
No. 5: Formula 30D 3RSF (30% DDT solution).
No. 6: 10DRDK in 45ft. palm, with 10-m.p.h. wind, at ¼ gal./acre. On *sheltered side* of palm.

High-speed flash photograph of swirling-type nozzle from a hand pneumatic sprayer in action (× 2)

TABLE 4
NEW ATOMISER FOR STANDARD 'MICRON' SPRAYER
(Rate per ½ gal./acre)

Sample plates on	*Average number of droplets per sq. in.*	*Average size of droplets, microns*
Ground ..	366	68
20-ft. palm	461	51
40-ft. palm	408	37
50-ft. palm	225	35

Trigona sp. and Coccinellid larvae. I have not been able to produce the same effects with the conventional type of nozzle.

Advantages of spinning disc nozzles

Mr. Courshee claims that the discs are expensive and their high rotational speed is a disadvantage. Naturally, a precision-built disc is more expensive than one spray nozzle, but in most conventional spraying machines 20 or more nozzles are used and one spinning disc costs about the same price as 20 conventional types of nozzles. One of the great advantages of the spinning disc nozzle is that it is not liable to get blocked, like the conventional type, since all the tubes and discs are at least ⅛ in. in diameter or apart. The conventional type nozzles wear far more quickly than the high-speed rotational spinning disc, so on this score alone the spinning disc works out cheaper than the conventional nozzle. The spinning disc can be used to spray insecticides and emulsions, suspensions and wettable powders in water, whereas three or four types of nozzle would be required to handle these different types of insecticidal formulations. With the spinning disc work can be carried out more effectively, quicker and at a far lower cost than with the conventional type of nozzles.

This is not the only advantage. Experimental results of the work in Zanzibar indicate that the droplet size, together with the insecticidal formulation, can be used to obtain selective kills of insects. So it may be possible, after careful study, to formulate a spray that will kill the pests yet leave the beneficial insects unharmed. Naturally, when large areas have to be sprayed this is of paramount importance.

Spinning disc atomisers with weedkillers

The spinning disc atomiser has also been found to be advantageous for application of selective weedkillers. It has been found that 6 lb. of 'Ferroxone' per acre is required in the conventional boom sprayer to kill most of the weeds in one of the Government coconut plantations, whereas 1 lb. of 'Ferroxone' per acre, applied by the 'Micron' sprayer, produces a better result. This is chiefly due to the fact that the stomata are on the underside of the leaves and most of the spray from the boom sprayer falls on the upper surface of the leaf, whereas with the 'Micron' sprayer pointing towards the ground the vegetation is blown over at an angle and it is the undersides of the leaves that receive most of the spray, with a far better coverage. Fears have been expressed that there is a danger of drift using this type of sprayer, but if the droplet size is kept large—about 100 to 200 microns—and the head pointing slightly downwards practically no spray is carried beyond 20 yd., and the little that is is insufficient to cause any damage to other crops.

Japanese Irrigation Project

An irrigation canal which would help Japan to raise her rice crop substantially is the most important of several projects for which a loan is being sought from the International Bank for Reconstruction and Development. A reservoir and 50 power plants would also be built under the scheme, which would supply water for agricultural purposes in Aichi Prefecture and also the industrial centre in the Nagoya district. The irrigation canal would help Japan increase her rice crop by 280,000 koku (one koku is about five bushels).

The Royal Horticultural Society Autumn Show

This year the Royal Horticultural Society of England staged its autumn exhibition at Olympia in Kensington. The show, although, of course, not attempting to challenge the annual spring show at Chelsea, was productive of a large number of fine exhibits and presented a wonderful display of floral beauty, completely filling the National Hall at Olympia and its galleries.

Pride of place, of course, must go to the exhibits of autumnal and late summer flowers, chrysanthemums, dahlias and asters, of which a marvellous collection appeared from the nurseries and gardens of professional horticulturists and nurserymen from all parts of Britain. Attractive exhibits of gladioli were also prominent, displaying a remarkable range of colours and shades. A special feature which attracted much attention was the collection of orchids displayed by Messrs. Sanders, of St. Albans.

Altogether, despite the inclement nature of the summer, the show demonstrated once again that Britain can really excel in horticulture.

A number of trade exhibits was staged in the galleries, mainly of sundries likely to be wanted by the amateur and professional horticulturist. The society itself organised a scientific exhibit from its gardens at Wisley, demonstrating certain diseases and pests of garden plants and methods of controlling them.

South African Wattle Exports

South African exports of wattle bark and extract were slightly lower in the first eight months of this year compared with the corresponding period of 1953. The approximate totals given are 60,000 tons of extract and 10,000 tons of bark. Stocks were negligible at the beginning of the 1953-54 season.

Forestry Policies in Africa

ERIC FORD

The effect of forest cover on the agricultural possibilities of a territory are well known. In the following article, the author discusses the position in Africa south of the Sahara in the light of the report of the International Commission for Technical Co-operation in that region.

ONE of the most important problems facing the various administrations in Africa is the need to ensure a more orderly exploitation of the forestry resources of the continent. Accordingly, it was a wise decision on the part of the Commission for Technical Co-operation in Africa south of the Sahara (C.C.T.A.) to include forestry in its programme of activities. Since C.C.T.A.'s membership comprises the governments of Belgium, France, Portugal, the Federation of Rhodesia and Nyasaland, the Union of South Africa and the United Kingdom, it is clear that its studies not only cover a wide geographical area, but also extend over a broad range of experience.

Since C.C.T.A. is an inter-governmental administrative organisation with no executive power, it devotes much of its resources to the sponsorship of technical conferences. One such conference was convened recently to discuss African forestry problems under the somewhat startling theme: 'Africa's forests must be protected against the depredations of man, which menace the future of Africa.'

Underlining this statement, the conference report, in an outline of principles, claims that forests, in Africa as elsewhere, contribute towards water conservation and the maintenance and restoration of soil fertility. This is in addition to the more obvious role of supplying forest products both for local use and as an essential cash crop for export. To maintain sufficient forest areas to ensure the success of these principles, it has been found necessary to establish either properly demarcated reserved forests, which are closed against cultivation, or protected forests, which are open to cultivation under strict safeguards.

The attitude of the African natives

However desirable these policies may appear to officials, it is never easy to convince the native inhabitants of the need to limit their traditional activities in forest areas. In Sierra Leone, for instance, native farmers persist in farming steep slopes which should be reserved for forests, while from several French territories come reports of natives clearing reserved forests against regulations owing to lack of supervisory staff. A special difficulty has been encountered in the Gambia, where the forest adviser has noted: 'A difficulty here is to reconcile the conflicting interests of forest conservation and protection with the possible need to thin out or clear vegetation as an anti-tsetse measure.' To obviate the hostility of both natives and settlers, the conference recommended each territory without delay to issue a statement of its forest policy at the highest level.

The forest estate

Once the forest estate has been constituted there arises the question of its protection against damage, which is likely to arise mainly through illegal cutting and clearing for farm and domestic use. Recognising this, many territories allow the retention of old-established common rights. In French West Africa, for example, common rights still permitted in reserved forests include the extraction of dead wood and the picking of fruits, food crops and medicinal plants.

In French Guinea, natives are allowed to graze their cattle in reserved forests, to crop low-lying ground unlikely to suffer erosion and to extract wood. Natives in Portuguese Angola are permitted to cut trees for their own use in reserved forests, but are forbidden to operate thinnings. Similar rights are granted in Uganda, where natives have the privilege of taking firewood, bush poles (and, indeed, all except Class 1 timber) for building and domestic purposes, with the proviso that these privileges may be withdrawn if they are considered sylviculturally harmful by a senior forest officer.

Communal forests

If it is difficult to interest the natives in a large impersonal reserved forest, it is sometimes felt that a communal forest, belonging to a small, close-knit community, might prove more interesting, since such a forest can provide a village with on-the-spot timber requirements and even create a source of revenue if cash timber is planted. This latter point is being considered in the Niger (French territory), where communal plantings of *Borassus aethiopium*, *Hyphaene thebaica* and gum and palm trees are projected. In Sierra Leone and the Gambia, communal forests to provide local timber are being planted on land which has not previously carried useful crops. A similar policy is followed in Nigeria, where communal forests are planted on old farm land near centres of population where overcropping has rendered the land temporarily unfit for agriculture.

Village headman in Dahomey with teak he planted 25 years previously

(*Left*) **Avenues of** *Grevillea robusta*, **19 years old;** (*centre*) **Eucalyptus, 26 years old; and** (*right*) *Sweetia Brachystachya*, **a fire-resistant species from Brazil**

Bush fires

A continual source of trouble in forest areas in Africa is the bush fire, which in most cases is virtually impossible to control when once under way. For this reason, most territories have adopted the early burning system (that is, deliberate and controlled burning of forest, bush and grass areas during the early part of the dry season, to forestall uncontrolled conflagrations later on). In fact, the policy of early burning has been followed for so long in Sierra Leone and the Gambia that in some districts the work is entrusted to the tribal authorities.

Forest utilisation

Even when the forest estate has been laid aside and protected against natural and human depredations, the task of the forest service is only half accomplished; there remains the correct utilisation of the forest and the continual struggle to improve it. Tropical forest exploitation is frequently the opposite of the felling policy required by a true selective system. The timber extracted represents forest capital which has accumulated over many years and cannot be easily or quickly replaced. It should, therefore, be an axiom of a wise forest policy so to link the utilisation and regeneration of a forest that its productivity is, at worst, maintained and, if possible, improved over the years. At the same time, it is a particularly difficult aim to achieve because of the restricted number of merchantable species in tropical forests. Moreover, the same methods used in different places often produce divergent results, owing to differences in the composition of the forests, ecological conditions and the varying characteristics of the species.

Natural regeneration

French West African experience in this connection has included both close plantations and strip planting and useful results are reported from natural regeneration, both in dense forests and savannahs. In dense forests, Niangon and *Turraenthus africana* have proved successful, while in savannah-type areas teak, *Cassia siamea* and *Albizzia lebek*, among others, have proved their worth. Two experimental stations engaged on regeneration studies in the French territories of Senegal and Mauretania have reported that plain scattering of seeds on the soil is useless, while even if the seed is buried in the earth losses are considerable (40,000 seeds must be sown per hectare in order to yield 100 seedlings).

Experience with natural regeneration methods in Sierra Leone has revealed varying results, according to the composition of the original crop. In semi-rain forest areas, good natural regeneration has been obtained with *Cistanthera papaverifora*, *Bridelia feruginea* and *Cordia platythyrsa*, while in rain forest areas *Tarrietia utilis* and *Lophira procera* were most successful. Planting in lines under shade has been tried, but has not yielded particularly encouraging results, while close planting is too expensive, a general criticism of this method by all African forestry officials.

Introduction of new species

In view of the relative paucity of economic timber species throughout Africa generally, experiments have been made in most territories with a view to the introduction of new varieties from outside the continent. Acclimatisation is a vital point to be kept in mind, and if the introduction of new species is to be worth the financial risk involved the trees must be of high quality and it must be clearly established that no indigenous tree will meet the same need.

Surveying these experiments as a whole, however, the conference pointed out the danger of disturbing local flora, particularly by the chance introduction of new fungal diseases likely to affect economically valuable species. Nevertheless, introduction plans are in hand in most African territories and cover a wide range of exotics, including eucalyptus, teak, *Cassia siamea*, *Casuarina*, *Cupressus*, *Albizzia lebek*, *Acacia decurrens* and *Canarium schweinfurthii*. So far as savannah-type conditions are concerned, *Cassia siamea* has been found particularly suitable, since it is quick growing, readily adaptable, requires little care and regeneration by stool-shoot or local sowing is quite easy. Of special importance is the introduction of *Sweetia brachystachya Bth*, a leguminous plant from Brazil, which is to be utilised as a fire-break species—of great potential value in a region where bush fires are a perpetual danger.

An example of a typical introduction scheme is seen in Northern Rhodesia, which has been engaged in such experiments for more than 20 years. Since the territory has no indigenous softwoods, the main emphasis has been on the introduc-

Six-year-old *Cassia* **on the Ivory Coast**

tion of a conifer which will succeed on moister soils at 4,000 ft. with 45 to 50 in. of annual rainfall, but with a long dry season. Mexican pines have proved most satisfactory and it is now proposed to plant them on a commercial scale on the copper belt. In the maize farming region (average annual rainfall 30 in.), *Cassia siamea*, as elsewhere in Africa, has proved most successful.

Forest fallowing

It is necessary to remember, of course, that plans for the better utilisation of African forests must not be initiated without thought for the native inhabitants, most of whom depend on pastoral and agricultural pursuits which tend to clash with the demands of a successful forestry policy. In the Belgian Congo, a particular attempt has been made to make the best of both these worlds. Crop lands are laid out in strips or corridors, alternating with forest strips which are later cleared and used for cultivation, while tree species are planted on the strips previously cultivated. The length of the fallow period varies with ecological conditions and soil value.

Known as ' shifting cultivation combined with forest fallowing,' this system is also practised in French West Africa. Here the cycle of rotation varies from one to 10 years, but in many cases the duration of forest fallow is too short to enable the re-establishment of the forest or the recovery of soil fertility. In this region, too, the practice of transhumance results in the deterioration of grazing areas and reduced tree cover through the cutting of branches and the feeding of animals on leaves and fruit. It is proposed to prevent over-grazing around watering points by temporarily closing some and establishing a rotation of pasture areas. In Senegal and Mauretania, the necessity of stripping trees of leaves is recognised, since cattle have no other food resources by the end of the long dry season. Here the policy is to protect part of the forest while the remainder is being grazed. Similar experiences are reported elsewhere in Africa—in Sierra Leone, where seven years is considered a minimum fallow period, and in Northern Rhodesia, where a resettlement plan is in operation with a bush fallow of at least 20 years.

Propaganda to natives

Much of the success of all forestry policies in Africa depends on the extent to which the interest of the native inhabitants can be aroused by education and other means. While admitting the value of such propaganda as ' Arbor Days,' illustrated pamphlets, films and demonstrations, most administrations maintain that the co-operation of the natives is best obtained through policies which offer him a direct personal profit. One way in which this is done is by regulations under which occupiers who respect valuable trees on their land receive a payment when it is due to be felled. If he leaves the land before felling is due, he receives a premium on ceasing to cultivate the land. Nevertheless, most territories make some attempt to educate their native populations, and particularly the children, in the need for forestry. In Senegal and on the Ivory Coast, an annual tree festival helps to this end.

An interesting statement of the problem comes from French Guinea, where the administration believes that lasting success can only be achieved through education which flows from a staff recruited from the natives themselves; propaganda imposed by experts of the metropolitan power is not satisfactory. For this reason, a school for the training of native forest rangers has been established at which rangers who are already serving will be given further training and where applicants with no previous forestry knowledge but in possession of an elementary school certificate will be accepted. The school provides a general professional handicraft training.

Conclusion

It will be clear that the problem of the proper exploitation of the timber resources of the African continent is no easy one. C.C.T.A. is therefore the more to be commended for taking steps to direct the attention and energies of its members towards the matter. It is also worthy of satisfaction that meetings of forestry experts are to be convened by C.C.T.A. every two or three years. Permanent liaison between forestry services in C.C.T.A. member states will also be maintained during the intervals between conferences. Further developments are promised and will be awaited with interest.

Photos : C.C.T.A.

A New Forage Crop

Recently, a demonstration was given on the farm of Mr. Michael Lester at Leckhampstead, near Buckingham, by Surface Silos Ltd. of a new fodder plant which is stated to have been produced in Germany and introduced into England under the name of ' Topine.'

The plant is said to be a hybrid between *Helianthus tuberosus* and *Helianthus macrophyllus*. The aerial parts of the plant grow to a height of 7 ft. or more and can be used for making silage by the usual methods, while it also produces tubers resembling potatoes. The crop is planted like potatoes. Planting takes place in the month of March and the green parts are ready for harvesting in September-October. After harvesting the stems, the tubers are left in the ground until the following March, when they can be harvested by any of the ordinary types of potato spinner. The yields per acre are claimed to be up to 20 tons per acre of green material and 8 tons per acre of tubers.

It is claimed that so far the plant has not been found to be attacked by any diseases or pests, while it can be grown satisfactorily on most types of soil with the exception of very heavy waterlogged soils. Both the green matter and the tubers can be used for forage for animals and can be ensiled by the usual methods, while the tubers can be processed for industrial uses. It is stated that in Germany, to which country the use of ' Topine ' has been confined so far, the results obtained with it have been uniformly good and it is regarded with favour as showing considerable promise.

So far at Leckhampstead two five-acre plots have been planted which gave promising indications. The crop is also being tried out at Woburn Experimental Research Station.

WORLD CROPS

IN OUR NEXT ISSUE there will appear the second part of W. H. Pawley's article, **The Possibilities of Increasing World Food Supplies,** and the third part of **The Development of Spraying Machinery** by R. J. Courshee. In this issue there will be a report of the **Smithfield Show.** There will also be other articles, besides the usual features.

Approved Seed Peas in Britain

Almost 8,000 acres of marrowfat peas entered by 24 firms were examined this year under the dried pea seed approval scheme operated by the Home-Grown Threshed Peas Joint Committee with technical assistance from the seed production branch of the National Institute of Agricultural Botany. Altogether three growers' crops, comprising 32 acres, were graded as field approved foundation seed and 249 crops, totalling 6,160 acres, reached the required standard of field approved stock seed.

The Golden Jubilee of the British Cotton Growing Association

JUBILEES are very much the fashion just now and the latest body to celebrate an occasion of this description is the British Cotton Growing Association, which this year attained the 50th year since its incorporation by Royal Charter in 1904.

Increased cotton production

The British Cotton Growing Association, which, incidentally, should not be confused with the Empire Cotton Growing Corporation, was founded with the object of expanding cotton cultivation within the boundaries of the British Commonwealth. During the period of its existence, it has done an enormous amount to expand the production of cotton. At the time of its formation, Lancashire was almost entirely dependent for supplies of raw material on cotton from the southern states of America, with smaller quantities from Egypt, India and one or two other foreign countries.

Since then, the production of cotton in Commonwealth countries has expanded to nearly 1 million bales of 400 lb. annually, an achievement of the highest importance.

Fields of activity

As part of its work, the association has supplied seed for planting, erected ginneries and undertaken the buying and selling of the cotton produced in a large number of territories. Its fields of activity have covered East Africa, including Uganda, Tanganyika, Kenya, Rhodesia and Nyasaland, and Nigeria, South Africa and Australia, as well as the West Indies, India, Pakistan and the Sudan.

Sir William H. Himbury, M.A. (*from a painting by Captain Henry Lamb, M.C., R.A.*)

Its activities have resulted in raising the standard of living of millions of cultivators in many parts of the world. Throughout its history, it has worked in the closest association with the governments of the various countries and with successive Governments in Great Britain with the happiest results.

To mark this jubilee, the association has issued an attractive handbook giving details of the history of the association from its earliest years down to the present time, illustrated with a large number of photographs showing various aspects of work.

Association officers

The president of the association is the 18th Earl of Derby. The first president was Sir Alfred Jones, K.C., M.G.; he was succeeded by the 17th Earl of Derby, who held office from 1910 to 1944. The present chairman is Sir William Himbury, who has served with the association almost from the days of its inception and who, despite advanced years, still presides over its destinies. To the association we offer our hearty congratulations on its jubilee and look forward to the steady expansion of its excellent work for many years to come.

The yard at the association's Mbale ginnery, Uganda, on a buying day

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Austrian Grain Imports

Austria is having to import unusually large amounts of rye and wheat to make up for this year's poor bread grain harvest. A total of 2,000 tons of rye have already arrived from Argentina and another 5,000 tons are on order from that country. Contracts for a total of 30,000 tons have been concluded with countries in South-Eastern Europe—primarily Hungary—and first deliveries under these contracts are expected shortly.

Supplies of wheat are also short. The Government has ordered the storage in silos of 38,000 tons of the total crop and remaining supplies are not sufficient to meet millers' day-to-day requirements. To help supply the market until the stored wheat is released for sale, 10,000 tons of Rumanian wheat—of about the same quality as that grown in Austria—was to be imported between mid-October and mid-November. In addition, it is planned to import 50,000 tons of wheat during the last quarter of 1954, the total to include 15,000 tons of Northern Spring wheat, 15,000 tons of Theiss wheat and 20,000 tons of Manitoba wheat. Millers are obliged to mix these high-quality wheats with the ordinary varieties in order to produce flour of the prescribed quality. Trade circles report, however, that the lots of Theiss wheat which have so far been received are not of sufficiently high quality to be used as 'quality wheat,' so that Austria may have to look elsewhere for its supplies of the high-quality variety.

The Potato Root Eelworm in Europe

In the January 1954 issue of World Crops *there appeared an account of the potato root eelworm* (Heterodera rostochiensis) *which constitutes a most serious menace to the potato crop in temperate regions. The European Plant Protection Organisation (EPPO) has recently published an account of the present position in regard to this pest in various countries of Europe; we reproduce below part of this communication with due acknowledgment.*

IN appraising the incidence of the potato root eelworm in Europe, it must be remembered that the biology of this pest differs widely from that of other pests dealt with by E.P.P.O. Its capacity for active movement is very limited. Some vertical dispersion in the soil may occur, in which a rise of the soil water is probably involved. On the other hand, pockets of infestation can remain the same shape for several years if left undisturbed. It seems, therefore, that horizontal dispersion would be negligible if mankind did not continuously change the picture. As it is now, the dangerous cysts, which can remain viable over a long period and contain numerous eggs or larvae, may be carried with plants or parts of plants in the adhering soil. Thus the main spread of the pest is due to external causes. It may be rather unpredictable and erratic, as it is based on human transport on a small scale or in international trade. Consequently, geographical relationships are of minor importance and for this reason the different countries must be considered separately.

New incidences

Some ' new incidences ' have been reported in territories where *Heterodera rostochiensis* had not hitherto been found. Unfortunately, the possibility exists that in different regions the potato root eelworm is present even if it has not yet been ascertained. The relation between grade of infestation (number of viable cysts or larvae) in the soil and the symptoms of damage in the aerial parts of the plants is complicated. In principle, heavy infestation should result in a poor crop and finally lead to failure. In practice, the picture is often less clear, as other factors have an influence on this correlation. In times of unfavourable weather or in places where moisture or manure is deficient, symptoms may show even if the infestation in the soil is not very high. Usually, however, the reverse is the case. Conditions in most potato centres are not unfavourable, and especially when good weather induces rapid growth in the plants the chances are that no symptoms of damage will show even if the underground infestation has built up to a considerable extent.

Frequently, the presence of *Heterodera rostochiensis* will escape attention if it is not specially searched for. Thus it is evident that the reporting of a new incidence of the pest does not merely express its potential danger to crops. The fact that the incidence is discovered in a country pays some tribute to the efficiency of its inspection service. Moreover, a newly reported pocket will usually be kept under regular observation. In the same way, it is not alarming that around recently established pockets other fields are found to have become infested in the following years by local transports of limited scope. Such ' new infestations,' though serious to those personally involved, do not aggravate the general position. From the international standpoint, they should even be considered as improvements, as the knowledge of the presence of *Heterodera rostochiensis* opens the possibility for proper precautions against its spreading from one country to another.

Newly infested territories were reported in 1953 by Algeria and Iceland, whereas ' normal ' spread of a local character was ascertained in France (St. Malo), Jersey, the Netherlands (north and north-east), the Saar, Sweden and parts of the United Kingdom.

Research

Research is in progress in several countries. The possibilities of direct control of the pest and of the breeding of nematode-resistant potato varieties are the main subjects of investigation. In Denmark, soil samples were taken in all gardens of one of the smaller towns and also in all farm land around this centre in an attempt to determine the ' radiation ' of a pocket of infestation under the circumstances prevailing. In Jersey, a heavily infested field is reserved for a long-term study of different problems.

Control

1. Stimulants of emergence. In Germany, it was ascertained that the secretion of young potato roots activated the emergence of larvae far more strongly than did the secretion of old roots. In the Netherlands, the use of root secretions is considered not yet to have reached the practical stage.

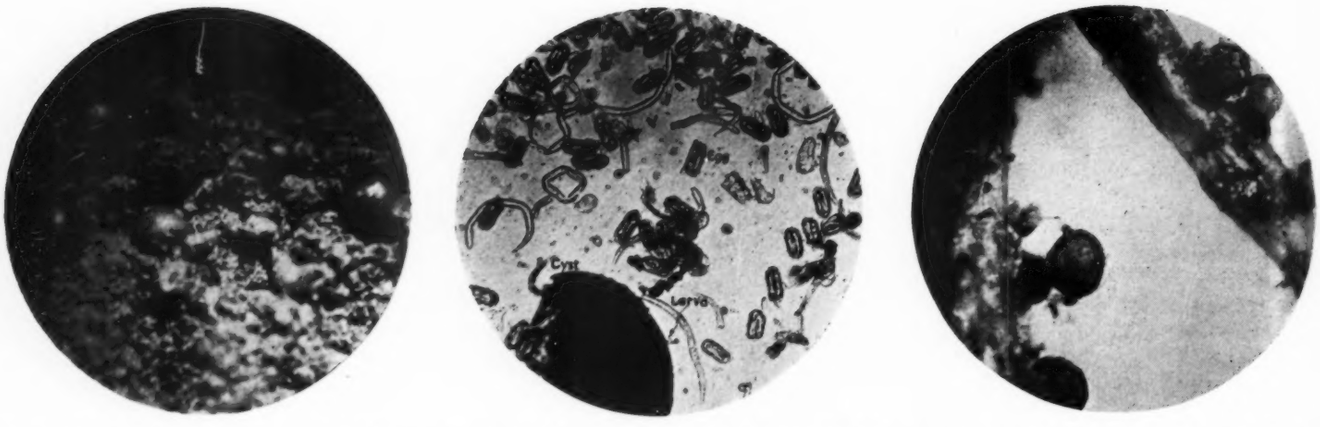
2. Nematicides. Most experience has been gained with regard to soil injection with DD, a mixture of dichloropropane and dichloropropene (propylene). In Algeria, this product is considered to be more economic than other soil disinfectants. In Jersey, it gave consistently good results on growth and yield of outdoor tomatoes. In the Netherlands, it was found to be economic for glasshouse tomatoes. In France, however, where experiments were carried out with three treatments at a rate of 130 or 160 litres per hectare both in heavy and in light soils, although a considerable increase in yield was obtained, it was found that the roots still carried numerous cysts. It is assumed that the chemical retarded egg development, but did not kill the nematode. Even if such a delayed infestation has definite advantages, it is considered that a dosage of 160 litres per hectare is not economic, especially in heavy and cold soils, where the product diffuses too slowly.

3. Other means. In Germany, it was found that electric currents, X-rays, high- or low-pressure and ultrasonic waves did not affect the formation of cysts or the emergence of larvae.

4. Natural enemies. In the Netherlands, some progress has been made with regard to unicellular predators, but the results are not yet considered to be of practical importance.

Resistant potato varieties

In Germany, resistance to *H.r.* was found in some tuber-forming wild *Solanum* varieties (including some strains of *S. andigenum*) and also in some bastards of a polyploid clone of *S. vernei* and a breeding clone. No ground for this resistance could be ascertained; it was not correlated with emergence-activating properties. In the Netherlands, breeding results seem to justify the hope that in a limited number of years the first resistant varieties will be available. In England, work along these lines has also been intensified.



The potato root eelworm and its life cycle. (*Left*) **Cysts lying free in the soil, able to attack a potato crop.** (*Centre*) **Under the stimulus of excretions from the roots of potato the contents of the cyst become active; eggs hatch into larvae which migrate towards the roots and attack them. Part of a cyst deliberately broken open is shown in the lower part of the illustration.** (*Right*) **The female eelworms, after pairing, make their way to the surface of potato roots and become new cysts full of eggs. These fall from the roots into the soil when the potatoes are lifted**

Position in the various countries

Algeria

Incidence. In March 1953 symptoms of damage became apparent around Algiers and a survey was made of all potato and tomato growing areas. This was done by looking for cysts on the roots and to some extent by soil sample examination. Eight communes in the near vicinity of the city of Algiers were found to be infested. In this coastal zone, often two, or exceptionally even three, successive potato crops are grown in one year on the same fields.

Austria

Incidence. Some pockets exist in the west near St. Anton (Arlberg). The infestation further east in Salzburg seems to have been stopped.

Belgium

Incidence. The infested coastal strip of 25 km. long and 1 km. wide is regressing.

Denmark

Incidence. In seed potato fields, 25,000 samples were taken in 1951 and 20,000 in 1952; 0.21% of these contained cysts, but their numbers were small. In 11 communes, all potato fields, including village gardens, were sampled. Here, 0.8% of the samples contained cysts, which is attributed to a rather widespread infestation in one village. All nurseries were checked and two samples out of 1,774 contained cysts.

Finland

Incidence. Infestation was found in the same four localities as in 1952, chiefly along the coast between the cities of Helsinki and Hanko. Survey is being continued.

France

Incidence. An area of infestation has been found in the Department of Ille et Vilaine in Brittany, probably with St. Malo as a centre. The position was unchanged near Paris, but in the north (Dunkirk) there was a marked regression due to the fact that in this area potato growing has been almost entirely discontinued.

Germany

Incidence. From 1951 to 1953, 240,000 soil samples (taken at a rate of 200 per hectare for agricultural land and 2,500 per hectare for gardens) were examined. The infestation amounted to 0.1% of the checked areas. It was chiefly found in gardens and small fields on which potatoes had been grown continuously in the period of food shortage after the war. This way of growing now having been discontinued, the risk of further infestation has decreased.

Guernsey

Incidence. One or two new infestations were found, but the full extent is unknown.

Iceland

Incidence. In late August, the pest was found at Reykjavik. A survey of all main potato fields was then carried out during September by examination of roots. Infestation was found in five other places situated along the west coast of the island (just north of Reykjavik and from there towards the south). The survey is being continued.

Ireland

Incidence. No material changes. There is very little *H.r.* in the country.

Italy

Incidence. *H.r.* has not been recorded.

Jersey

Incidence. Every year infestation is found in about 50 to 60 fields. It is expected that this will again be the position. The area infested did not change, but the effect on crops in 1952 appeared to be worse than normal. In voluntary seed certification, 414 fields (77 farms), all in the north of the island, were examined; 3.1% were found to be infested.

Luxembourg

Incidence. *H.r.* has not been recorded.

Malta

The island is free from the pest. There are no special import regulations.

Netherlands

Incidence. A number of new cases in the neighbourhood of known infested plots was found, but not in the pocket in the west. No new foci were ascertained.

Norway

Incidence. *H.r.* has not been identified with certainty.

Portugal

H.r. has not yet been recorded in the country. No survey has been made.

Saar

Incidence. In the Homburg district, a field of about 1 hectare, where infestation had already been ascertained in the previous year, was again planted to potatoes. Symptoms now became clear and a number of neighbouring fields were also found infested. This had escaped attention in 1952 owing to the vigorous growth of the plants. A general survey by means of soil sampling is contemplated.

Spain

No new pockets have been found, although root examination and sampling has been continued, especially in fields growing seed potatoes. In Spanish Morocco, *H.r.* has not yet been found.

Sweden

Incidence. In 18 communes, infestation

Continued on page 506

Agriculture in South Africa in 1953

The following review of the farming situation in South Africa at the end of the year 1953 is contained in the introduction to the report of the Secretary for Agriculture of the Union of South Africa, and is reproduced from the journal 'Farming in South Africa.'

THE past year has served as clear proof that the production potential of the South African agricultural industry has risen considerably during the past few years and that, provided the rainfall is fair during the growing season, food production will certainly keep pace with the ever-increasing demands of the growing population. After a year of ravaging droughts and a few preceding years of insufficient rainfall in various regions, the summer of 1953, with few exceptions, was marked by a precipitation over the entire country which enabled the farming industry to reach the highest production figure yet recorded in its history. The maize crop attained a record figure; the same applies to groundnuts, kaffircorn and field beans. The slaughtering of stock reached new peaks and it was possible to abolish rationing to butchers early in the New Year. The wool clip was the highest for many years, and the total milk flow and egg production equalled and even surpassed former production figures. Wheat is the only crop to show a decrease as compared with that of the previous year, on account of the late summer rains in the northern production area, but the decrease is more than offset by the increase in respect of other crops. The grape crop almost equalled the previous record production, and deciduous fruit and citrus both experienced good seasons.

High yields

The agricultural industry thus experienced a year of plenty, and could largely recover from the setbacks of the previous drought years. As a result of the high yields per soil unit, the net income from farming under the system of fixed prices applicable to the great majority of products was appreciably higher in controlled products than in the years immediately preceding. The wool cheque was bigger than that in respect of the previous year and, notwithstanding losses arising from the drought experienced during the previous summer, the wool farmers constituted the most prosperous group of farmers for the year.

Soil conservation

In South Africa, with its erratic climatic conditions, it is proverbial that rainfall and crop yields go hand in hand. The fact, however, that rainfall is such a decisive factor in production unfortunately obscures the great progress made by agriculture in technology and in the field of improved farming methods. The general public judges according to the weather: if it happens to be a wet year, the good crop is attributed to the rainfall; if it happens to be a dry one, the farmers are held responsible for the low yields. During a good year, Mother Nature is lauded for her rich gifts, but during a bad year the farmer is taken to task for not adapting his farming to the natural conditions.

The plain truth is that the good crops of the past year are not attributable to Nature only; an exceedingly large percentage of the increased yield reflects the structural changes in the field of farming systems and scientific practices. The principles underlying the Soil Conservation Act have slowly but surely been accepted by the farmers, and the spirit of conservation farming has infiltrated everywhere. The farming community is now fully aware of the fact that the maintenance of the production level and the increase thereof, without damaging the soil and destroying soil fertility, can only be brought about by the application of scientific methods.

The progress under the Soil Conservation Act is far too often measured in terms of the number of conservation works completed and of the outward signs of erosion still in evidence everywhere. Since they are less conspicuous, farming practices, the essence of soil conservation, are lost sight of, and can most times not be properly evaluated by the man in the street. It is in this field of farming practices, and of the building up of soil fertility, where marked progress has been made during the past few years. In the winter months, the grain lands of the Western Cape Province are a veritable Eden of blue, white and yellow lupins; grass and clover leys are rapidly increasing in the highveld; lucerne and grass have already become firmly established in the high-rainfall areas; the subdivision of pastures into camps is progressing and veld burning is being eliminated more and more or else rigidly controlled. These are but a few examples of the visible signs of the improvement in farming practices brought about by the farming community—the outward proof that the lessons of science are understood and are being applied on an ever-increasing scale.

Mechanisation

There has also been enormous improvement in the field of soil cultivation and moisture conservation, largely as a result of the quickened pace brought about by mechanisation. In the days of the trek-ox the highveld farmer could scarcely plough, plant and cultivate his extensive fields. Today, the tractor can be employed day and night to plough and plant when the rains come, to cultivate for weed control and to harrow with a view to conserving moisture. The speed with which the crop can now be sown, however, has this disadvantage, *viz.* that per farm the plantings take place at more or less the same time and the entire crop is consequently susceptible to damage when unfavourable climatic conditions set in. However, farmers learn by experience to distribute their plantings over a period and thus also make better use of farm labour.

Mechanisation has increased the total crop and, although not extensive, there is still scope for increases in this direction. The maize industry, for example, is still awaiting a suitable harvester combine which can be applied generally and which can successfully bridge the limiting factor to increased production, *viz.* a shortage of farm labour.

Animal husbandry

Another field in respect of which considerable progress has been made is that of animal husbandry. In spite of the fact that the livestock population has almost remained constant during the last number of years, there are a great many visible qualitative changes for the better. The milk yield per cow is still low and the fattening of slaughter stock is still in the initial stage, but great progress has been made both as regards the breeding and feeding of animals. Proof of this is that the total milk production (butter, cheese, condensed milk and fresh milk) is still on the increase, that the utilisation of concentrates has increased by leaps and bounds during the past few years and that the slaughtering of stock shows a larger percentage of younger animals each year. In so far as sheep breeding is concerned, the woolled sheep is being improved from year to year and better adapted

to the various regions, while fat-lamb breeding is already becoming an established industry in some parts of the country.

Research

It is with a feeling of pride and cheerfulness that the Department avails itself of this opportunity to state that the farmers are becoming more and more susceptible to the facts of science and that the attempts of its technicians to introduce sound systems of farming are beginning to bear fruit. It is true that the Department does not dispose of an adequate number of technical personnel to comply with the ever-increasing requirements of the agricultural industry, completely to satisfy the farmers' great thirst for scientific knowledge and to silence altogether the appeals for technical advice, yet a distinction should be drawn between clamourings for conservation works in respect of which subsidy is payable and enquiries in regard to farming practices. The first-mentioned category dominates by far.

It is only natural that conservation-conscious farmers should be desirous of arresting and covering the raw wounds of erosion on their farms and would thus be anxious to cover up dongas, build silt dams, stabilise spruits and river courses and erect watering places in grazing camps in the shortest possible time. It is patent that these tasks should be tackled, but these wounds resulting from erosion should be viewed in the light of faulty farming practices in the past, and it should be realised that they can only be permanently healed if the causes are eliminated. In the case of the grazing areas, it was over-grazing and a lack of rest periods for the veld which were the main causes of soil erosion; in the cropping areas, on the other hand, water and wind erosion followed in the wake of denudation of the soil arising from mono-culture, change in the structure of the soil as a result of a decline in soil fertility and the absence of soil-binding ley crops.

Conclusion

Priority should thus be accorded to the farming aspect, *i.e.* to methods which should be applied to check further deterioration. On the part of the Department, it comprises research and extension, investigations into the scientific truths of each and every region and guidance with a view to having these truths put into practice by the farming community. These are the two tasks which call for the attention of the Departments' technicians in the first place. It stands to reason that certain conservation works, such as contour banks and interior camps which form part of sound systems of farming, go hand in hand with the scientific planning of the farm, but with the limited technical personnel at present in the service of the Department we are forced to put first that which comes first, and our technicians must first tackle the causes of erosion ere the dire consequences of previous malpractices can get the attention due to them. As the main task is accomplished and the Department's technical personnel is built up, the pure reclamation activities will increase. At present, the policy is aimed mainly at conservation followed up by reclamation; and if in the application of this policy individual farmers are perhaps disappointed in respect of particular erosion works, the Department puts forth the plea that, with the small staff at its disposal, it is trying to serve the national interests.

1953-54 Farm Output in Northern Ireland

In spite of a reduction of about 33,000 acres in the area under crops, Northern Ireland farmers in 1953-54 made remarkable advances in production. The estimated value of the year's production was £89,250,000, compared with £83,500,000 in 1952-53 and under £15,000,000 in 1938-39.

Tillage decline

In a recent statement in the Northern Ireland House of Commons the Minister of Agriculture said that there was a further decline in the area under tillage. The total area under crops, including hay, was 2,700 acres less than in 1939. The British Government last year appealed to farmers in the United Kingdom to increase the tillage area by a further 1 million acres by 1956. In the first year of this programme Northern Ireland had made no contribution whatever towards that objective, but had, in fact, gone backwards to the extent of nearly 33,000 acres in the area under crops, including hay.

Simultaneously, cattle and poultry numbers had also decreased, although there had been sharp increases in the numbers of sheep and pigs. With the present volume of mechanical equipment on farms in Northern Ireland farmers should, however, be capable of achieving considerably more tillage than in 1939 and it was difficult to understand why they did not do so in their own interests.

Increased production

On the other hand, in the first year of the four-year United Kingdom programme Northern Ireland had made a remarkable advance in production generally. This arose mainly from livestock and livestock products, where the increase had been beyond the highest expectation.

In the case of fat stock, the total increase had been about 36,000 tons in one year, although the quota for the four years was expected to be about 8,000 tons. Pig meat showed the main increase of 25,400 tons, an increase of 37% on the previous year's production, whilst there was an increase of 8,300 tons in the quantity of beef and an increase of 2,000 tons in the quantity of mutton marketed. Eggs showed a decrease of 3¼ million dozen, but milk production increased by 5½ million gallons, although there was, in fact, a decrease in the number of dairy cattle.

Value of output

The estimated value of the agricultural output of Northern Ireland in 1953-54, excluding subsidies, is £89¼ million, compared with the 1952-53 figure of £83½ million, an increase of nearly £6 million.

'The present forecast for 1953-54,' said the Minister, 'shows that our estimated farm output of pigs will be about 1,290,000, compared with only 181,000 in 1946, prior to the commencement of the 1946-47 agricultural expansion programme, and with the pre-war peak of 876,000. Pigs now constitute the largest single item in our production, the estimated annual value to producers being over £28½ million.

'The output of sheep has also increased to approximately 500,000, compared with 250,000 in 1946, whilst milk output has increased to almost 127 million gallons from 103 million, and the output of eggs is estimated to be 75 million dozen, compared with 59½ million dozen in 1946-47.

Shipments

'In the calendar year 1953 the estimated value of shipments was over £63¼ million, which included £13 million for bacon and ham and manufacturing pork; £19⅜ million for fat cattle, sheep and pigs; £12½ million for eggs and poultry; £6 million for canned foods and £7 million for milk products. This surplus was shipped after all our own requirements at home had been adequately met. The total of £63¼ million compares with £7⅜ million which was the estimated value of shipments in 1938.'

Myxomatosis in Britain

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THE deliberate introduction into Australia of myxomatosis or rabbit plague has undoubtedly brought immense economic benefit to that country. Rabbits are a pest in Britain also, and myxomatosis has now reached these islands. Are we to expect wholesale destruction of our own wild rabbit population and corresponding economic gain? The answer to these questions is not easy, for myxomatosis seems to be behaving very differently in South America, which is its native land, in Australia, in France and in Britain.

In South America, the virus of myxomatosis infects the native rabbit or tapeti (*Sylvilagus brasiliensis*), causing a non-fatal disease and is carried by mosquitoes (*Aedes* spp.). Its existence became known when, in 1898, it infected Sanarelli's laboratory rabbits in Montevideo and almost wiped them out. Domestic rabbits are derived from wild European rabbits (*Oryctolagus cuniculus*) and in them, in contrast to the tapetis, myxomatosis is almost uniformly fatal. Accordingly, Aragão[1] suggested that the virus could be used for exterminating wild European rabbits where these were a pest, as they decidedly are, especially in Australia.

Early attempts to follow up this idea in Australia, Britain and Scandinavia attained only limited success: the disease obtained no permanent foothold. In 1950, further attempts were made in Australia to use the infection for destroying wild rabbits. Six of seven liberations apparently came to nought, but the seventh, just when it was thought to have failed likewise, suddenly flared up over unexpectedly wide areas. Probably it was spread by mosquitoes. Since 1950, myxomatosis has spread over much of south-eastern Australia, where it is estimated to have killed four-fifths of the rabbits in 1952-53 and to have increased rural production by £50 million.

In 1952, a French doctor introduced the infection into his estate south of Paris. He succeeded in his object of killing off his wild rabbits; but the disease did more: it spread beyond his park and in less than two years it had covered most of France and has now reached the north of Scotland. Why the disease has been spreading so widely when previous attempts to introduce it failed we do not know. In France, the disease was by no means generally regarded as a blessing. Possibly the economic gains were on balance greater than the losses. But the disease affected not only wild rabbits, but also the tame ones in rabbitries, which are of much economic value; and the *petits chasseurs* were very vocal because their weekend sport was spoilt.

Myxomatosis reached Britain about September 1953—how, we do not know. It could have been deliberately introduced by man, carried in infected mosquitoes or in rabbit fleas which had become accidental passengers on birds. The occurrence of the early outbreaks in counties facing the Channel—Kent, Sussex and Essex—suggests a natural method of spread rather than an intentional introduction. In view of the early failures to spread the disease, it seemed likely that the disease might die out during the winter months. On the contrary, it smouldered in its original foci and new centres of infection were reported nearly every week in south-east England.

Late in 1953, an advisory committee was appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland. Its first decision was to approve the attempts made by the Ministry to 'contain' the early outbreaks, to give time for the whole position to be assessed. But the virus was not to be contained; it spread despite man's efforts and with increasing momentum as summer followed spring.[2] There is no doubt that when farmers began to realise that they had much to gain from destruction of rabbits they obtained infected animals and released them on their own properties. The bigger 'jumps' of infection in the early summer of 1954 can be traced to such introductions.

The official attitude hitherto has been to take no part in, and in fact to deprecate, intentional spreading of the disease. A major reason for this concerns an aspect of the disease not yet discussed: the disease is a very unpleasant one. Infected rabbits are of a revolting aspect; their eyelids are so swollen that their eyes are closed; their faces, the bases of their ears and often their genitalia are swollen. When they are ill they come into the open and sit about, breathing slowly and often with difficulty for several days before they die. Letters to newspapers reporting that they are 'in agony' and attempting suicide need not be literally believed; nevertheless, there is a very powerful and vocal humanitarian argument against spreading the infection in order to obtain economic rewards.

In order to foretell the likely future of myxomatosis in Britain, we need to know more of its method of spread and the controlling factors here and elsewhere. Thus we can better judge whether its activity in Britain should be helped or hindered.

Methods of spread

The natural disease in South America is apparently mosquito-borne. So, too, in Australia mosquitoes seem to play a major part. They and other biting insects seem to act only as mechanical transmitters of infection—'flying pins.' In its first year there the killing of rabbits was mostly along river beds only, *Culex annulirostris* being the main vector. But in 1951-52 spread occurred far away from rivers, *Anopheles annulipes*, a wide-ranging mosquito, being largely concerned[3]; this species is believed to feed on rabbits in warrens underground. The seasonal incidence and character of outbreaks in Australia are quite closely linked with rainfall and associated prevalence of different biting insects.

There is little exact information as to the method of spread of myxomatosis in France. The rapidity of spread and the frequency of attack on tame rabbits suggest that a flying insect, probably a mosquito, plays a major part.

In Britain, there has been no evidence of dramatic 'jumping' of infection as in Australia, except where man has intervened. It is thus interesting that there is, as yet, no evidence that mosquitoes are playing any major part in spreading the disease in this country.[4] The fact that there is widespread infection in wild rabbits, but only a few authentic infections of tame rabbits, is also evidence against participation of a winged vector. On the other hand, rabbit fleas (*Spilopsyllus cuniculi*), which do not occur in Australia, may well be acting as a vector here. I have found, as have others, that among rabbits kept free from ectoparasites cage-to-cage infection in the laboratory has not occurred. Fleas are abundant on wild rabbits and with warmer weather congregate more on the head, where myxomatous lesions chiefly occur. Though specific parasites of rabbits, they are occasionally carried on birds and presumably could in this way help in wider spread of infection.[5]

Changes in rabbit-virus relationship

A relationship in which a parasite kills more than 99% of its hosts is not likely to

be stable. In associations of long standing, host and parasite become adapted to living together, as is the case with myxoma virus and the South American tapeti. An adjustment in this sense is sure to take place elsewhere. Development of inherited resistance is likely to take a long time in rabbits—even they are slowly breeding beings in comparison with a virus. There is so far little evidence that offspring of recovered rabbits are resistant. On the other hand, there have been found in Australia virus strains of lowered virulence, taking longer to kill and killing only 90% instead of more than 99%. Rabbits living longer remain infectious longer and the virus can therefore spread more readily, so that one with a tendency to kill more slowly has an evolutionary advantage.[6] So far there is little or no evidence of emergence of an attenuated virus in Britain, or, so far as one knows, in Europe. Indeed, the apparently more stable European strain is being used for reintroductions of virus into Australia.

Human intervention and myxomatosis

In Australia, even where the kill of rabbits is very high, the disease passes on, and surviving rabbits begin to breed. The new generation of rabbits will not be immune and to keep them down and, as the Australians say, to ' back up the virus,' other destructive measures are being used and, when needful, virus is reintroduced. Thus, myxomatosis is greatly helping Australian economy; but to take full advantage of it, scientific ' backing-up ' is being used on a very large scale.

In the British Isles, myxomatosis has now reached nearly every county of England and Wales and a number in Scotland and Ireland. Its incidence, however, is very patchy. In most counties one can walk for miles and see plenty of healthy rabbits and not a single diseased one. The total destruction of rabbits must be still trivial. The poor summer of 1954 may have militated against spread by ' flying pins,' It seems likely, however, that myxomatosis, except perhaps in south-east England, is only here and there. Things might remain like this into the indefinite future, with the disease spreading naturally or otherwise from farm to farm, parish to parish and back to its starting point as new susceptible rabbits grow up. There might well be no striking effect on rabbit numbers, except indirectly as the existence of the disease affected the trapping industry and the taste of the people for rabbit meat; these factors might leave us in many areas with more rabbits rather than less. Further, we should still have the disease with us, with local epidemics killing the rabbits in hundreds in its highly unpleasant fashion. If such should indeed be the outcome, we should have all the disadvantages of myxomatosis with no compensating economic gain. It might then be cogently argued that we should follow the Australian example, introduce the disease simultaneously into areas of convenient size and ' back it up ' intensively. The rabbit population might thus be drastically reduced with a resultant gain, not only to our economy, but also to our very natural wish to inflict the least possible suffering on the rabbits. Maximum suffering over a long period would be caused if the disease kept going spontaneously around the country like a travelling circus. Scientists did not introduce the disease into Britain, and no official or unofficial action of man can possibly stop it. What the disease will accomplish ' on its own ' we cannot yet foresee.

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Article reprinted from ' Nature.'

Agricultural Research in the Sudan in 1953

The following summary of some of the outstanding points in the situation regarding agricultural research in the Sudan in 1952-53 is taken from the annual report of the Ministry of Agriculture for the year in question.

Yields of cotton in the Gezira and White Nile schemes were fair, but not as high as was expected. The quality of the cotton was very poor for the second year in succession and this was considered to have been mainly due to the severe attack of whitefly. The cotton crop in the Gash Delta was badly damaged by bollworms (mainly the Sudan or red bollworm).

Entomological research continued on the biology of various pests, and some new methods of spraying, using small quantities of concentrated insecticides, show promise of proving much more economical than standard methods. Investigations in the Gash Delta have not revealed any promising insecticides for Sudan bollworm, but it is considered worth trying flooding the land to kill the resting pupae in the soil. Work on soil insecticides against stainer bugs in the Nuba Mountains shows a possible new method of attacking this pest.

There was a small invasion of the desert locust from the east. Partly because the locusts were old and partly because of the late onset of the rains there was very little breeding and no damage to crops.

Considerable success has been achieved in the control of *Striga* with the weed-killer 2,4-D. *Striga* is a plant which is parasitic on dura (sorghum) and makes dura growing impossible when the infestation is heavy. The cost of the treatment is largely offset by its general weed-killing effect, so that the increase in yield of grain is profitable.

The soil survey of possible irrigable areas was completed in Northern Provinces by the Soil Research Section and in the Fung and Rahad-Dinder areas by Sir Alexander Gibb and Partners. The section has examined all the samples and the survey, apart from its estimate of good irrigable soil, has added much to our knowledge of the soils of the central rainlands.

Tozi Research Farm, the new station for the central rainlands, had a successful first season. Observation rows of 360 varieties of various crops, mainly dura, groundnuts and cotton, were grown. Preliminary trials were begun on fertilisers and to see the effect of one crop upon the following one. Unridged groundnuts were successfully dug up from the heavy clay soil mechanically. Sesame was sown by machine and an excellent yield obtained.

The breeding of sorghums for combine harvesting under local conditions and the production of non-shattering sesame were begun.

At Yambio Experimental Farm, a long-term rotation experiment to elucidate the effect of different types and durations of bush fallow was begun. Results were obtained with fertilisers and an experiment started to see how long continuous cultivation can be carried on under various conditions of management before deterioration sets in.

To Authors and Readers

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Log sawing, using the new engine for power

N.R.D.C. Ricardo Prime Mover Demonstration

A small steam engine, capable of operating on fuels such as low-grade coal, lignite, peat, wood and agricultural and industrial wastes, has been developed as an alternative to petrol or diesel engines by the National Research Development Corporation in co-operation with Ricardo and Co. (1927) Ltd. The unit was recently demonstrated at the Corporation's Sondes Place Research Station at Dorking in Surrey. It is believed that the new prime mover will answer the need for a small engine in countries with little or no indigenous resources of liquid fuel and where mechanisation of agriculture and village industries is one of the ways of raising the standard of living of the people.

The units

The prime mover, as designed, consists of three units which can be transported separately and assembled *in situ* with the minimum of difficulty or delay. These three units are (*a*) the furnace, (*b*) the steam generator and (*c*) the engine. The prototype engines demonstrated are of vertical, twin-cylinder, uniflow type covered by patents, with a special (patented) valve arrangement to ensure economy of steam consumption. Particular attention has been paid to low steam consumption, since this determines the size of the steam generator required for a given brake horse power; tests have shown that this engine has a specific steam consumption of only 30 lb. per horse-power hour.

The prototypes develop a continuous output of 2½ b.h.p. at 1,250 r.p.m. when supplied with steam at 150 p.s.i. gauge pressure. Capacity for overload is considerable and an output as high as 3.5 h.p. can safely be obtained intermittently. For many purposes a somewhat larger version of the engine will be required, but no difficulty is anticipated in scaling up to, say, 5 h.p. continuous rating.

The furnace, steam generator and engine are coupled together to form the complete prime mover. This can be fixed on various types of mounting, including a simple trailer, and is easily transportable.

Uses

The units can be used for supplying power for many purposes, including irrigation pumping, log sawing by chain saw, timber seasoning, corn grinding, electric light and hot water supplies.

Technical News

The December issue of *Fibres* (*Natural and Synthetic*) contains ' Recent Developments in Copolymers,' by L. Valentine; ' Man-Made Fibres in the Rubber Industry—2,' by J. W. Illingworth; and ' Electron Microscope,' by V. W. Palen.

Paint Manufacture for December includes ' Accelerated Weathering of Paint,' by W. Toeldte; ' The Fire Hazards of Painted Surfaces,' by R. W. Pickard; and ' Trends with Titanium Dioxide.'

The contents of the December issue of *Atomics* include ' Elastic Scattering of Alpha-Po Particles on Hydrogen,' by M. K. Juric; ' Radiation Therapy with Radioactive Cobalt-60,' by J. H. Pannell; and ' American Standards for Radioisotopes.'

New Castrol Managing Director

As from October 1, Mr. Leonard M. Broadway took over the position of managing director of C. C. Wakefield and Co. Ltd. from Mr. Alonzo Limb, who has had to relinquish this office owing to ill health. Mr. Limb will continue as a director of the company. His judgment and extensive experience will undoubtedly prove of great value to the Board.

Mr. Broadway, who is 50, joined the company 34 years ago. He was appointed secretary by the late Lord Wakefield in 1938. Following a wide experience in administrative and financial matters, including the formation of the Wakefield group of subsidiary companies, Mr. Broadway was elected to the board in 1947, becoming joint assistant managing director in 1952.

Retirement of Mr. H. S. Taylor

From Australia comes the news that Headlie S. Taylor, inventor of the header harvester, has retired from his executive position with H. V. McKay, Massey Harris Ltd., after a career that has influenced grain harvesting in most of the major wheat-producing countries.

His first patents were taken out in 1913 and mass production of the new machine commenced at the Sunshine Harvester Works from 1916. The front or gathering section of the header was a radical departure from previous practice. It comprised a long tooth comb to guide the crop to the cutting knife and, for the first time, twin steel spiral augers to take the heads and straw back and along to the elevator. Threshing and cleaning were completed by a rasp-bar drum, straw walkers and riddles.

The header gained ready acceptance through its efficient handling, not only of good crops, but also of the storm-flattened crops previously given up as a total loss. Developments under Mr. Taylor's direction included the first direct harvesting of field peas in 1919 and engine-functioned headers in 1922 harvested a great diversity of difficult seed crops and were adapted to gather the first Australian-grown rice.

In 1924, came his famous self-propelled auto-header. Powered by a four-cylinder engine, it was made in 12-ft. and, later, in 14-ft. sizes and at Horsham, Victoria, in 1938 one of these machines created a world record by harvesting 198,000 lb. of wheat from 76 acres in one day. The first auto-headers exported went to Buenos Aires in 1927 and to Kansas in the United States in 1928, followed by a steady trade that included Canada, South Africa, England and New Zealand.

Australian Agricultural News

From our Australian Correspondent

Hybrid maize seed

Increased safeguards for buyers of hybrid maize seed will be incorporated in a new hybrid maize seed certification scheme to be introduced by the New South Wales Department of Agriculture. Under the new scheme, all hybrid maize seed will be sealed under departmental supervision. At present, some second generation seed which is much lower yielding than true hybrid seed is being sold as genuine hybrid seed. The new plan will bring New South Wales in line with Queensland, which already has a certification scheme.

Rice scheme

A wealthy United States business group may grow rice on a large scale in the Northern Territory. The group has proposed that it should be allowed to invest a large sum of money on a pilot area to test the prospects of commercial rice growing on the understanding that it would then be able to obtain a larger area. The rice would be exported to Asia. Announcing the group's interest in growing rice in Australia, the Minister for Territories, Mr. Paul Hasluck, said, ' Every care is being taken to protect the Australian public interest and to leave ample opportunity for Australian settlers and Australian capital in the same field. The suggestion that 2 million acres is involved in the negotiations is fantastic. If you were to think in terms of 100,000 acres you would be nearer the mark. We have to grow up beyond the infantile attitude of viewing with doubt and suspicion the possibility that the nationals of a great and friendly power may be willing to give a hand in developing the resources of our country.'

Rubber import tax

The Planters' Association of New Guinea has asked for the removal of the import tax of 2d. a lb. on Papuan rubber into Australia. The Minister for Trade and Customs has asked the Tariff Board to investigate whether ' having regard to the Commonwealth's responsibility for the development of its territories, the production of crude rubber and rubber latex in the territory of New Guinea-Papua and the importation of those products into the Commonwealth should be accorded assistance.' The president of the Planters' Association, Mr. B. Fairfax-Ross, had stated that the basis for the association's request was that other New Guinea crops were not subject to an import tax and it was unfair that rubber should pay both an import tax and an export tax. He said that at present producers of coconuts, cocoa, rubber and some other commodities pay an export tax on the gross value of their produce. The export tax on rubber is 1d. a lb., while the price does not exceed 2s. 6d., and rises by 1d. a lb. for each 6d. by which the price rises above 2s. 6d. Removal of the import tax would help to encourage the production of rubber, which was strategically important, Mr. Fairfax-Ross said.

Wheat bulk-handling

A plan for the bulk-handling of wheat in South Australia has been submitted to the Premier, Mr. Playford, by the bulk-handling committee of the S.A. Wheat and Woolgrowers' Association. The secretary of the association, Mr. Stott, M.P., announced that a proposed Bill had been forwarded to the Premier to grant a growers' co-operative company a charter to finance, own and control bulk-handling of wheat in South Australia. Mr. Stott said the company would raise its finance from tolls advanced by growers as a free-of-interest loan. It would be repaid by a revolving system of finance in 12 annual instalments every 12 years. Mr. Stott said that provision was made in the Bill for the company to carry on as bulk wheat receivers, shippers and marketers in the event of the Australian Wheat Board going out of existence. To be proclaimed law, the Bill must be passed by a vote of growers sowing more than 50 acres.

Coarse grains

In contrast to the world wheat situation the position of coarse grains is quite hopeful. This was said recently by the managing trustee of the Wheat Pool of Western Australia, Mr. H. E. Braine. He said that there was no telling how much of this was due to strictly short-run influences, such as the delay in the Western European barley and oats harvest. The nominal value of West Australia's new crop six-row barley was 10s. 9d. a bushel f.o.b., or about 8s. 9d. at sidings with an average rail freight. The nominal value of W.A. new crop oats at ports was about 8s. a bushel. These were purely tentative figures, Mr. Braine said, as there were no supplies in the state to test the market. Last year's export surplus had been sold, while the new crop was generally backward.

The effects of a summer which in many parts of the Northern Hemisphere is admitted to have been amongst the worst on record have been severely felt in Great Britain. The harvesting of hay crops has been carried out under conditions of extreme difficulty, while a large proportion of grain crops have been laid in the field. The accompanying aerial photograph taken in Hertfordshire shows strikingly the manner in which grain crops have been laid as the result of the unpropitious weather

RESEARCH DEVELOPMENTS

A Possible New Chemical for Eradicating Nutgrass

NUTGRASS (*Cyperus rotundus*) is one of the most troublesome weeds to eradicate in plantation crops in the tropics and sub-tropics. In the southern United States, it is a constant source of difficulty, in the West Indies it is a troublesome weed in cultivation, in the Eastern Hemisphere it is well known also, while in the Sudan under the name 'seid grass' it is regarded as about the most troublesome weed that has to be contended with in cotton cultivation.

Reproduction by seed is rare, but the weed spreads rapidly by underground tubers which form at the ends of growing rhizomes. The tubers possess a variable number of buds and several shoots may grow from each, and on this account ordinary cultural operations, either manual or mechanical, are not effective in eradicating the weed, since they often only result in subdividing the tubers and fresh plants may arise from each fragment. It is claimed that methods such as soil fumigation or soil sterilisation have proved effective as control measures, but the use of these on a large scale is not economically feasible. The normal hormone weed-killers, such as 2,4-D, are apparently ineffective.

In these circumstances, some recent work by E. W. Hauser, of the United States Department of Agriculture, working with J. Thompson at the Georgia Agricultural Experiment Station and reported in a recent number of *Agricultural and Food Chemistry*, hold out some possibility of successful control and is thus of considerable interest.

These workers report that 3 amino-1.2.4. triazole and several related compounds have given promising results in pot experiments when used as salts of 2,4-D or MCPA or phosphoric acid with a wetting agent.

It was found that the effect of applications to the foliage of nutgrass was to produce severe chlorosis, while translocation of the compound through the tubers is recorded.

In discussing the results, the authors say:

'Responses induced by aminotriazole in nutgrass indicate that this compound may be potentially useful in the weed control field. Under greenhouse conditions the severe chlorotic symptoms resulting from the most effective treatments persisted for a period in excess of six weeks. However, in most cases the plants were not killed and were very slowly recovering when the experiments were terminated. Although photosynthesis in the new growth was disrupted, presumably respiration continued. Such a reaction, if it could be extended over a considerable period of time under field conditions, would be expected to exhaust the reserve food supply in underground storage organs of susceptible perennial weeds. The herbicidal potentialities of aminotriazole in combination with tillage operations should be investigated.

'Aminotriazole is very interesting from a physiological standpoint because of its striking effect on new growth. Spray applications of 1 lb. per acre induced severe chlorosis in the new growth of nutgrass, yet the application of 2,4-D-aminotriazole mixtures or an aminotriazole salt of 2,4-D permitted near normal or partial production of chlorophyll. Further research is needed to clarify these relationships.'

Obviously, much more work is needed before a definite opinion can be given regarding the potentialities of these compounds, but if further research substantiates their effectiveness against this troublesome class of weeds it may be of considerable importance.

REFERENCE

Ellis, W. Hauser, and Jack Thompson: *Agricultural and Food Chemistry*, **2**, 680.

A New Mercurial Seed Treatment

In recent years the number of mercurial seed-treating materials has rapidly expanded. The latest addition to these preparations is a product called 'Merculine.' Some mercurial compounds are purely germicides, but many are not. Many mercurial salts ionise in solution; in soaps double decomposition takes place and in some preparations metallic mercury is precipitated and deterioration in disinfectant properties occurs.

'Merculine' is the emulsifiable concentrate of 10% phenyl mercuric salicylate. It has been developed and manufactured by H. L. Woudhuysen and Associates.

The salicylate being water insoluble, formulation as a liquid had to be made in the form of an emulsifiable concentrate. On account of this, the preparation is a representative of a new class of emulsifiable organo-metallic compounds with properties and characteristics not to be found in other mercurial preparations.

It is stated by the manufacturers that the protective dose of 'Merculine' on wheat seed is ¼ fl. oz. per bushel, but in actual practice ½ fl. oz. is prescribed. On vegetable seeds effective doses start at 1 fl. oz. per 100 lb. Like all mercurials, 'Merculine,' when used in excessive dosages, may become phytotoxic and it is important to avoid over-dosage.

It is also claimed that 'Merculine' shows promise as a germicide and bactericide.

The claims for 'Merculine' are:

1. That it produces no dust or fumes.
2. Indoor treatment can be carried out without extra ventilation.
3. There is no corrosion of metal containers, which can accordingly be used for shipping and storage.
4. Applications are effective in all types of liquid and slurry treaters.
5. Effective disease control is obtained with small concentrations.
6. Stored or packed seeds which have been treated do not give off fumes or dust when handled.

It is further claimed that, as the preparation is an oil solution of an organic mercury compound, it is not volatile or corrosive, while handling does not involve undue hazards, so no extra ventilation is required.

Villiers Booklet

A combined operating instructions and spare parts booklet dealing with its new Mark 15 four-stroke petrol engine for agricultural and industrial applications has been issued by the Villiers Engineering Co. Ltd., Marston Road, Wolverhampton. Illustrations clarify routine attention and 'exploded' drawings of the engine, carburetter and magneto enumerate the individual component parts. Copies of the booklet are available on request, price one shilling.

South African Citrus Acreage

With more water available since the raising of the Lake Mentz Dam wall, citrus farmers in the fertile Sundays River valley are developing about three-quarters of their acreage instead of one-third. Thousands of young trees are being planted throughout the area. Planting will continue for two to three years. The Sundays River valley can now withstand three years of drought. Last year the citrus industry exported through Port Elizabeth nearly 1,500,000 cases out of a total of more than 5,250,000 cases exported from the Union. There has been a rise in the value of developed farm land in the Sundays River valley.

NEW BOOKS

World Population and World Food Supplies

By Sir John Russell, F.R.S. Pp. 513. London. Allen and Unwin. 1954. 50s.

The name of Sir John Russell as the author of a book is a sufficient guarantee that its contents are entitled to respectful attention and in the case of the present work this holds abundantly true. The situation of the world in regard to the possibility of continuing to produce sufficient food to meet the needs of the constantly increasing populations has provoked many authorities to examine the position in the world as a whole or in particular parts of it, the result being seen in the rapidly increasing number of books and other forms of literature devoted to discussions of various aspects.

But among all these efforts this remarkable work must be accorded a position of pre-eminence, for surely none of them has attempted to assess the position in all the main geographical regions of the world with the same authority and a like fund of detailed knowledge, much of it was accumulated, it must be added, through direct personal experience in many lands.

Since Sir John Russell's retirement from the direction of Rothamsted Experiment Station some 12 years ago he has made the subject of world food production and the future outlook in this respect peculiarly his own. In his memorable presidential address to the British Association at Newcastle in 1949, he gave to the world a lucid and striking appraisal of the situation which must long remain engraved on the memories of all who were privileged to listen to it. In this book, he elaborates and develops the various facts and arguments outlined in that address and expands them into a coherent and detailed narrative embellished and illustrated by examples and data drawn from all over the world and set down with that admirable clarity of exposition of which he is an acknowledged master.

After an introductory chapter in which are set out the salient underlying features of the problem, including the rate of growth of the world's populations, the work goes on to examine the detailed aspects of agricultural production as it presents itself in various parts of the globe, beginning with the United Kingdom, continuing with the various other countries of the Continent of Europe, going on to deal in turn with conditions in various regions of Africa and Asia, and subsequently with the food exporting countries of the Western Hemisphere and Australasia and the great potential food-producing region of South America, concluding with an appraisal and discussion of trends in world food supplies.

In every case, the position is dealt with in considerable detail and illustrated with numerous statistics, while there is ever in evidence illuminating comments oftimes the result of personal observations on the spot.

In fact, it is hardly too much to say that, taken as a whole, the book affords an almost unrivalled commentary on the agricultural position in almost every part of the world. The book is fully illustrated by numerous plates of reproductions of photographs, as well as by numerous graphs and diagrams in the text.

One can only hail the book as one which should find a place on the bookshelves of everyone who is interested in the great and pressing problems of population increase and food supply. In his long life, Sir John has given to the world many books and published papers which rank as classics in the literature of agricultural advancement. The present work is a crowning achievement; one can only hail it with respectful admiration coupled with astonishment that to one man it should have been given to accomplish so much.

H.T.

South African Food and Agriculture in World War II

By J. M. Tinley. Pp. 138. Stanford University Press. $5.00. Oxford University Press, London, 40s. 1954.

In this book, Dr. Tinley gives a careful and unbiased account of the conditions affecting South African agriculture in the late 'thirties, and traces measures taken to control shortages and distribution during the war and in the post-war years up to 1948.

Compared with many countries, South Africa experienced little discomfort through food shortages during the war. In fact, despite a population increase, the per capita consumption of cereals and most other products was higher than in pre-war years. Post-war difficulties were not caused by conditions arising out of the war but by a succession of years of unfavourable weather resulting in poor crops. So serious was the post-war food situation that all wartime controls over agriculture, foodstuffs and prices were continued and experts from the British Ministry of Food invited to advise on the situation. They recommended a complete revision of food control administration and the introduction of a limited rationing scheme. This conclusion is interesting, for one feels that, while the Government were at pains to control prices, their policy as regards distribution was weak and largely ineffective.

During the war, food rationing was deemed unfeasible because of the wide variation in buying powers and consumption between and within the various racial groups. Instead, a not very successful system of allocation to wholesale and retail merchants was introduced for such commodities as meat, butter, tea and rice. The author concludes that there is little doubt that rationing would have resulted in a more equitable distribution of scarce commodities, while the difficulties involved in introducing and administering the scheme would have been no greater in South Africa than in many other countries.

Accepting the recommendations of the experts, the Government made preparations to introduce rationing. By the time these were completed the food situation had improved, for considerable quantities of wheat and maize were imported in 1946, crop prospects for 1946-47 appeared favourable, and the Government, never enthusiastic over coupon rationing, abandoned plans for its introduction.

The war materially disrupted South African agriculture. New markets had to be found for certain products which previously went to Germany, shipping difficulties curtailed exports and caused a large surplus of perishable fruit, and there was an acute shortage of many essential products, particularly of agricultural machinery and fertilisers. These difficulties were successfully surmounted and in the organisation created to achieve these ends, the various marketing control boards, established before the war, rendered valuable assistance.

D. H. GRIST

Farm Animals in Health and Disease

By W. R. Wooldridge, Ph.D., M.Sc., M.R.C.V.S. Pp. xvi + 463. London. Crosby Lockwood. 1954. 30s.

In the first part of this book, the author contrasts farm animals in sickness and in health, points out the losses to the farmer occasioned by livestock diseases, discusses the general principles of disease control and sums up the possibilities of improvement in these regards in the future. The second part of the work is given up to the consideration of the principal diseases of cattle, sheep, pigs, goats, horses, poultry and rabbits in the United Kingdom.

The book is written for the information of the practising farmer rather than for the professional veterinarian and is intended

to awaken awareness to the magnitude of the losses to the farming industry occasioned by disease and to induce farmers to have recourse to the services of the veterinarian whenever circumstances indicate the necessity for such a course. In this connection, the descriptions of the various maladies that may be encountered, the risks to be apprehended therefrom and the principles involved in their treatment are of high value. While it is in no sense a substitute for the invocation of professional assistance in treating animal disease, the book is, or should be, an invaluable aid to the farmer and stock breeder in diagnosing trouble and, if its advice is followed, it can, no doubt, be the means of avoiding loss and needless expense.

The name of the author, who is the Director of the Animal Health Trust, is a sufficient guarantee of the soundness and value of the work. The book is fully illustrated by a number of reproductions of photographs of animals in health and disease and of line drawings. For a book of this character the price, 30s., is remarkably low; it can be cordially recommended.

A Multilingual Vocabulary of Soil Science

By G. V. Jacks. Food and Agriculture Organisation of the United Nations. 1954.

It is a tribute to the manner in which soil science is expanding in importance and general application that it should have been found desirable to produce a multilingual vocabulary of terms used in it. Actually, the project for its production was suggested by the apparent difficulty experienced by agricultural workers in translating the concepts of soil terms used in one language into other languages. The work has been produced by Mr. G. V. Jacks with the collaboration of a large number of other workers in various countries. It gives the equivalent terms for a large number of words used in soil science in eight different European languages, including Esperanto. It should be of great use to the workers all over the world for whom it is intended.

The Rhodesian Farm Year Book, 1953

Salisbury. *The Rhodesian Farmer*. 1953.

This is the first publication of a work which is intended to provide a concise compendium of information about agriculture in Rhodesia. It gives details of the crops grown, the breeds of cattle kept, the machinery used and the fertilisers and chemicals employed to maintain production in Rhodesia, with a vast amount of information about agricultural legislation and the legal position of many industries and activities, on pests and diseases of crops and livestock, about water resources and irrigation, the labour position and farm electricity, the marketing of agricultural and livestock products, together with much statistical information about production.

The book is due to the initiative of the enterprising publishers of *The Rhodesian Farmer*, who are to be congratulated on the production of a handbook which should be of value to all concerned with agriculture in Rhodesia. We wish it every success.

Mineral Nutrition of Fruit Crops: Deciduous and Evergreen Tree and Small Fruits

Edited by N. F. Childers. Pp. 907, illustrated in the text and including 120 plates. Horticultural Publications, Rutgers University.

The major portion of this book consists of a series of reviews on the nutrition of different types of fruit, each by its appropriate American expert. Thus there are chapters dealing, in alphabetical order, with the nutrition of (1) apple, (2) avocado and mango, (3) blueberry and cranberry, (4) bush fruits, (5) cherry, (6) citrus, (7) grape, (8) edible nuts, (9) peach, (10) pear, (11) plum, prune and apricot, (12) strawberry and (13) tung. There are other chapters on the leaf analysis of citrus, on isotopic tracers, on chelated metals and on the subject of experimentation with orchard trees, while the final chapter includes a 20-page table of data from numerous sources on the mineral composition of fruit plants.

A large photographic section has been inserted in the middle of the book. This consists of 120 monochrome plates, many of which include two or more photographs, mainly to illustrate deficiency symptoms in a wide range of fruit plants. Some are poor and could well have been omitted, but the majority are useful in giving a general impression of various nutrient disorders.

The book is very well produced and, in general, is easy to read. Uniformity of style and treatment is not to be expected in an omnibus production of this nature and the separate reviews also show great variation in length. Every chapter ends with a long list of references in which American work naturally predominates, but the authors have in many cases taken account of research carried out elsewhere. Apart from the usefulness of having an up-to-date review dealing with each type of fruit, it is easy, thanks to an excellent subject index, to find information on a particular nutrient in relation to all types of fruit. There is also an index of authors.

The only really disappointing feature is that the editing is not as meticulous in detail as it is effective in broad outline. It is irritating to find, for instance, a number of examples of a research worker appearing with two or even three sets of initials and therefore credited with more than one list of references in the index of authors. The list of corrigenda, which is badly placed at the end of the book, contains some further errors.

This book is so good in general that the occurrence of these blemishes is no reason for not regarding it as a source of information indispensable to everyone concerned with the problems of fruit nutrition.

D. W. P. GREENHAM.

American Potato Yearbook, 1954

Edited by John C. Campbell. South Elm Street, Westfield, N.J. 1954.

We have received a copy of the 1954 American Potato Year Book; it is currently edited by Mr. John C. Campbell, of Reitgers University, and it contains 80 pages of information valuable to all connected with the potato industry. A special feature is the excellent article on the usefulness of the potato crop by A. E. Murker, of the United States Department of Agriculture. A new addition to the book is information on the United States standards for potatoes. In addition, it contains much valuable statistical information.

Between Us and Hunger

By C. Mayadas, M.A., B.Sc. London. Oxford University Press. 1954.

This is yet one more of the steadily increasing list of books written with the object of arousing attention in various countries to the urgency of the problem which faces the world at present of producing food to feed the ever-increasing populations. This particular work deals with the problem in one of its most acute forms, namely, that presented by the Republic of India, where, to quote Sir Alfred Chatterton, it is recognised that, as in many other densely populated parts of the tropics, there is a growing shortage of food.

The author sets himself to examine the problem and to estimate the weaknesses of the present position and the prospects of resolving the difficulties successfully. In the 12 chapters that make up the book he passes the salient features of the situation in review and comes to the conclusion that, if advantage is taken of all the existing possibilities, the problem, in its short-term aspects, is by no means incapable of solution. As has, however, repeatedly been pointed out, no long-term solution is

possible unless and until some effective limit is placed upon population increase.

It is of interest to recall that it is now close on 27 years since the report on agriculture in India by the Royal Commission presided over by the late Lord Linlithgow, in 1928, first saw the light of day. Few at this stage would challenge most of the conclusions that this body arrived at, but it is also remarkable how few of their recommendations have been put into effect and have borne fruit in the interval. It is true that India in the interval has been torn by political controversy and strife, and it is proverbial how incompatible with progress and advancement such conditions are. It is also true that at the end of this period of strife India has emerged with a constitution of her own, free to direct her own affairs, but it is also true that under the new conditions, although there is a veritable spate of goodwill and good intentions, little so far has been suggested that did not find a place in what was once described as the agriculturist's bible for India.

Nevertheless, in producing this work the author has performed a useful service in outlining in clear and forcible English many of the needs of Indian agriculture. Of the various chapters, those which struck the reviewer as most worthy of praise and attention are those dealing with the consolidation of holdings, the conservation of water supplies and the mechanisation of agriculture, while the last two chapters on reorganising to produce more and looking ahead are worthy of close attention. The plea in the last chapter for the incorporation of a greater amount of co-operation into Indian farming re-echoes the plea put forward by Prof. P. N. Diver in his book on land tenure reviewed in these columns in 1951.

It is to be hoped that this work will receive the share of attention from those charged with the direction of Indian affairs that it merits.

H.T.

Pesticide Handbook

By D. E. H. Frear. Pp. 196. Pennsylvania. College Science Publishers. 1954. $1.25 for paper bound and $3.00 for cloth bound.

This is the sixth American edition of this publication, previous issues of which we have already noticed in WORLD CROPS. It contains a list of the numerous chemical preparations which are now marketed in the U.S. for treating insect and fungoid pests, destroying weeds and rodents and preserving wood. In all, over 7,000 preparations are listed. In addition, the book contains a wealth of other information regarding the use of all these substances, together with the compatibilities and hazards of pesticides and the methods to be applied in the case of accidental human poisoning by them.

Anuario Brasiliero do Comercio de Frutas

Brazil. Lipo-Tipo Guanabara S/A Rio de Janeiro. 1954.

This is the second issue of this annual, which is intended to provide information about the fruit industry of Brazil. It contains numerous articles and statistical tables as well as a list of commercial firms handling fruits in different Brazilian cities. The book is printed in Portuguese, but it contains sections in English. It is well printed and got up and there are a number of illustrations.

Brazilian Agricultural News

Soils project

In Brazil phenomenal industrial development has threatened the economic balance because of accelerating neglect of food production, but today the Food and Agriculture Organisation and the United States Government, in line with the Point Four Programme, are backing Brazilian efforts to bring the vast areas of rich land to a proper standard of production.

The present project is to study, classify and map Brazilian soils to determine the needs and the type of food that they are most suitable for growing.

In charge of the undertaking is Dr. Luiz Bramao, an officer of FAO, and with him working for the Escritorio Tecnico de Agricultura is Mr. Roy W. Simonson, of the Division of Soil Classification and Survey of the U.S.D.A.

Coffee crops

This year's coffee crop in the state of Sao Paulo is estimated to be only 2.2% above last year's record all-time low. The output is expected to be no more than 8.2 million bags of 60 kilos, against earlier estimates of 8.8 millions. The total number of coffee bushes in Sao Paulo in the current year is estimated at 1,365 millions, against 1,198 millions last year. Heavy rains prolonged well into the usual dry season are largely the cause of the low yield.

Fertiliser Subsidy Changes

The fertiliser subsidy in the United Kingdom will continue for another year but the rates of contribution will be different. A new Scheme (The Fertilisers (England, Wales and Scotland) Scheme, 1954) has been made for fertilisers delivered on or after July 1, 1954. It continues assistance towards the cost of nitrogenous and phosphatic fertilisers. Subsidy will again be paid on the nitrogen and phosphates in compounds. There have been various changes in the prices of the different kinds of fertilisers since the 1952 scheme was made and the changes in the new rates of subsidy are related to these changes in prices. This means that contributions are higher for nitrogenous fertilisers but lower for nearly all phosphatic fertilisers.

Spraying Prosecution

The appeals of an agricultural spraying contractor against convictions by the Huntingdon County Justices for contravention of the Agriculture (Poisonous Substances) Regulations have been dismissed.*

The Chairman of the Appeals Committee of the Quarter Sessions in giving the court's decision said that the offences were of considerable gravity and that it was very proper that the Ministry of Agriculture and Fisheries should have taken proceedings against the contractor. As, however, the prosecution was the first under these regulations, he felt that some slight reduction could be made in the amount of the fines. These were accordingly reduced from a total of £75 to £55.

*See WORLD CROPS, August, p. 340.

The Potato Root Eelworm in Europe

Continued from page 496

was ascertained for the first time in 1953. Practically all of these are situated in the areas where *H.r.* has been found earlier, *i.e.* around Stockholm and in the southern provinces.

United Kingdom

England and Wales

Incidence did not show material changes in 1953. The reduced potato acreage means that better rotations are possible; it is therefore expected that the number of crop failures will decrease.

Scotland

Incidence. A number of new infestations was discovered, but the distribution did not change.

Northern Ireland

The number of new infestations recorded remains very low. Survey is being continued.

REPORTS AND PUBLICATIONS

Annual Report of the Department of Agriculture, Federation of Malaya, for 1952

This report, as usual, contains a comprehensive review of agricultural conditions in Malaya as well as an account of the operations of the Department of Agriculture. Official agricultural policy has remained unaltered from that recorded in previous reports; within its framework, emphasis has been concentrated upon rice production, smallholders' rubber replanting and development of food production in connection with the new villages founded in connection with the anti-banditry campaign. In connection with rice production, important steps were the increase in the minimum prices paid for locally raised paddy and the subsidisation of fertilisers for rice cultivation in certain states; a third step was the appointment of a committee to consider ways of increasing the area planted in rice and the yields of paddy in Malaya.

An important step was the appointment of a committee to advise on the utilisation of land and water resources in Malaya; errors in land utilisation in Malaya have been not infrequent in the past and the provision of a clear statement of policy on the use of unalienated land should be of use in avoiding similar mistakes in the future.

Weather conditions during the year were abnormal, rainfall being, in general, well below the average. This resulted in a much diminished rice crop.

The area under rubber increased by some 77,000 acres, about equally divided between estates and smallholders. Replanting with improved high-yielding material proceeded steadily on estates, while some progress was made with the Government sponsored schemes for replanting smallholdings. Production of coconuts and coconut products was well maintained; oil palm production diminished slightly, probably owing to seasonal causes, but the planted area expanded to over 100,000 acres.

The pineapple industry showed no expansion and has by no means returned to its pre-war dimensions, but experimental work designed to improve production is in progress in Johore and Selangor. Tea production has continued to expand despite the existence of blister blight disease, while the experimental trials with cocoa as an estate crop continue to give promising results. Progress with the production of a number of minor crops is reported; manila hemp and jute show promise. It is surprising, however, that, notwithstanding present high prices and the fact that in earlier years the crop was formerly fairly extensively grown, little interest is apparently manifested in coffee cultivation.

The staff position in the Department of Agriculture materially improved during the year by the appointment of five new officers from the United Kingdom, but the Department continued to suffer from marked staff deficiency.

Notwithstanding this, good progress is recorded in many directions. Research work has been carried out on many subjects. In relation to rice, work has comprised breeding and selection, including hybridisation work carried out in connection with the International Rice Commission's hybridisation scheme, work on paddy soils and the control of pests. An interesting development was the attempt to utilise the tachinid fly (*Paratheresia claripalpis*), which is an effective parasite of sugar cane borers (*Diatroea*) in the West Indies, for the control of stem borers of rice, 10,000 puparia having been introduced from Trinidad with the help of the Commonwealth Institute of Entomology and the emergent flies liberated in paddy fields. The results of the experiment are being watched with careful attention. Much activity is recorded in relation to attempts to mechanise paddy cultivation, the somewhat disappointing conclusion being reached that at the present stage of development paddy alone cannot provide an economic basis for mechanisation.

The report as a whole is full of interest and provides ample evidence of valuable work in many directions. It is well got up and contains good photographs of a number of lines of work.

H.T.

The Annual Report of the East African Tea Research Institute for 1953

The report of the Tea Research Institute of East Africa for the year 1953 shows that this organisation has got into its stride and is performing useful work. Field experiments have demonstrated the effectiveness of mulching in the rather dry climatic conditions of East Africa. The indications are that tall grasses from waste land and the leaf fall from Grevillea trees planted for shade are of about equal value for this purpose.

In districts liable to tea yellows disease, caused by shortage of sulphur in the soil, it has been found that dressings of 200 lb. of sulphate of ammonia per acre afford adequate protection.

Work on vegetative propagation has been expanded and, although this work has no immediate commercial application in East Africa, its importance should not be minimised. Investigations have also been carried out on various aspects of tea manufacture, including work on the Clivemere roller and on the copper content of East African leaf, which is lower than that found in Ceylon. East Africa is fortunate in having few pathological problems, but a potentially serious infection caused by mosquito bug (*Helpeltis S.V.*) is reported from Tanganyika.

Obviously, the station is doing increasingly valuable work. The resignation of the director, Dr. T. Eden, in June of this year was a considerable loss, but his lengthy experience with the crop in Ceylon enabled the work of the East African station to be started on sound lines.

Report of the Mauritius Sugar Industry Research Institute for 1953

The first report of the Sugar Industry Research Institute of Mauritius does little but record the foundation of the institute and the circumstances which attended its inception. One cannot but wonder exactly what reasons led to the somewhat surprising change which its foundation involves. In the now distant past, Mauritius was among the first of British colonies to endow itself with scientific services in aid of agriculture in general and its sugar industry in particular by the inauguration of an experiment station known as the Station Agronomique, of which the first and only director was the late Mr. Philippe Boname. It was supported by a cess on sugar exports and within the somewhat narrow limits imposed by its restricted resources did much useful work. In 1909, a Royal Commission enquired into the administration of the colony and *inter alia* recommended that the station should be replaced by a Department of Agriculture. This department was inaugurated in 1912 and in the intervening period has done much to assist agricultural development.

Its activities expanded and came to include a sugar technology branch, a sugar experiment station and an agricultural college. The fruits of its work included the production of new varieties of sugar cane, which succeeded in doubling the sugar crop of the island, which between 1930 and 1953 rose from 230,000 tons to over 500,000 tons.

In the circumstances, it is a trifle difficult to appreciate the reasoning which led the Economic Commission of 1947 to recommend the retransference of the work of research on sugar cane from the Govern-

ment to the sugar industry and the reversal, to a large extent, of the recommendation of the Royal Commission of 1909, which would appear to have been so abundantly justified by events.

Although this may be obscure, no one will do otherwise than wish the new organisation well. The report gives a brief indication of the proposed structure of the new institute, which in a colony such as Mauritius—which is largely dependent on sugar and is ever likely to remain so by reason of the natural conditions—seems bound to assume in time many of the functions previously performed by the Department of Agriculture.

It is certainly good to find an industry like the Mauritius sugar industry so appreciative of the benefits which it has derived from research as to be willing to shoulder the cost of many activities which previously had been met from Government resources.

H.T.

Agricultural Report of the Alabama Polytechnic Institute for 1953

We have received a copy of this report, which is divided into a number of sections, including agricultural economics, botany and plant pathology, poultry, husbandry and also entomology. The staff of the station is a large one and comprises over 100 graduate officers in the various divisions. The work is obviously closely related to the agricultural needs of the state which it is designed to serve.

Annual Report of the Department of Science and Agriculture, Barbados, for 1951-52

This report covers the activities of the Department of Agriculture for the year 1951-52. The rainfall in the period was markedly above the average and this resulted in an abundant sugar crop which amounted to 187,643 tons and greatly exceeded production in any of the six preceding years. The area under sugar cane amounted to 44,739 acres, of which some 8,500 acres were smallholders' canes. The manner in which the area under smallholders' canes has increased is a feature of recent years. It is also worthy of note that peasant cane yields fall little, if at all, short of those obtained on estates. In this regard, Barbados is in notable contrast to most cane-growing countries and is an effective comment on the skill and good cultivation of peasant growers in the island.

The work of the Department includes investigations on the manuring of sugar cane, soil moisture studies with a view to extending irrigation. The campaign for the control of moth borers of sugar cane by the distribution of the egg parasite *Trichogramma* was continued, while experiments for the control of melolonthid grubs by the use of Gammexane and Aldrin have given promising results. Animal husbandry and animal health are included in the work of the Department; the former continues to grow in importance.

Obviously, the work of the Department is continuing to expand in importance and is having a marked influence on agriculture in the colony.

National Institute of Agricultural Botany Annual Report

The N.I.A.B. has recently published its 34th annual report, for the year ended December 31, 1953. This describes the year as one of steady progress, with some consolidation and preparation for further development.

As usual, the report includes interim comments on the performance of the many varieties of crops in trials. These include, for example, notes on some 70 different varieties of cereals as well as comments on varieties or strains of roots and fodder crops, beans and peas, vegetables and potatoes.

The report also includes reference to other aspects of the institute's work. Particular mention may be made of the enquiries into the feeding value of oat straw, the best time of cutting and the leaf/stem ratio in lucerne, the effects of growth regulator sprays on the development of the flowers in grasses, and the classification and identification of grasses, clovers and lucernes.

Malayan Rubber News

World production of rubber in 1953 amounted to 1,720,000 tons, of which 574,400 tons, or 33%, came from the 3,746,000 acres planted to this crop in Malaya. The value of net exports of rubber from that country in 1953 was £112,700,000. Exports were mainly to the United Kingdom (209,000 tons) and the United States (182,000 tons). Amongst other countries importing rubber from this source were France (69,000 tons), Germany (54,000 tons), Japan (52,000 tons) Italy (44,000 tons), Canada (33,000 tons) and Australia (30,000 tons).

Asians own 62% of the area planted with rubber in Malaya. Much of this is in small holdings (under 100 acres) owned by Malays. Of the larger estates (over 100 acres), Chinese own 468,000 acres and Indians 113,000 acres. Of estates of 100 acres and over, 521 are owned by public limited liability companies and 2,001 by private limited liability companies and private owners. The area held by the former totals over 1,100,000 acres and by the latter 933,000 acres, but, whereas almost all the limited liability companies are European controlled, 1,255 of the privately owned estates and companies are owned by Chinese and only 480 estates by Europeans.

For some years there has been a gradual replacement of old trees by selected high-yielding material. The area so planted is now 730,000 acres. The average yield per acre from high-yielding budded or clonal stock was 841 lb. per acre on European estates (slightly less on Asian-owned estates), as compared with 372 lb. per acre from unselected stock.

Great care is taken to meet the requirements of manufacturers. Whereas in the early days of the industry rubber was marketed either as smoked sheet or crepe, at the present time it is exported in many forms of sheet, crepe and latex. A further development of this nature was introduced in 1949, in which year an international scheme was inaugurated to market natural rubber according to its technical qualities. The physical properties are determined by regular tests at central testing stations on samples of rubber from estates, packing houses and remilling factories. Red, yellow or blue circles are stencilled on bales of this technically classified rubber (T.C.R.), indicating low, medium or high modulus rubber respectively, and thus providing useful information to the consumer.

(*Malaya Rubber Statistics Handbook*, 1953.)

Dr. Cardon's Visit

Dr. P. V. Cardon, Director-General of the Food and Agriculture Organisation of the United Nations, recently visited England. He met the Minister of Agriculture and Fisheries, the Rt. Hon. D. Heathcoat Amory, M.P.; the Joint Parliamentary Secretary, Mr. G. R. H. Nugent, M.P.; Dr. Charles Hill, M.P., Parliamentary Secretary, Ministry of Food; and the Earl of Munster, Parliamentary Under-Secretary of State, Colonial Office.

Dr. Cardon addressed the annual meeting of the British Association for the Advancement of Science at Oxford and also gave an address at a meeting in London arranged by the United Nations Association. During his stay he saw something of British farming and of the various activities of the National Agricultural Advisory Service.

FARM MACHINERY

Hooded Flame Gun

The use of flame throwers in agriculture has hitherto not attained any very great popularity, mainly by reason of the obvious risks of damage to crops or by the causation of widespread and uncontrollable bush fires. Controlled flame weeding has, however, attained popularity in the cotton growing areas of the United States, while recently the use of flame guns for weeding in other countries is extending. C. B. McAllen (Engineers) Ltd. have for some years manufactured apparatus of this type in England and are now marketing a 'Hooded Flame' machine.

The addition of the hood to the McAllen 'Paramajor' flame gun manufactured by them is said to concentrate a flame and the heat (2,000°F.) generated by it to an extent impossible with any other type of flame gun. This enables operators to traverse the ground more quickly, while the hood confines the heat and flame to such an extent that the machine can be walked, it is claimed, between the rows of row crops or soft fruit bushes to control weeds without risk of damage to the growing crop.

Automatic Chemical Powder Dresser

One of the best insurances against disease in plants is to dress the seeds with a suitable preparation in powder form. There is now available as an attachment to the 'Petkus' grain and seed cleaners and graders a chemical powder dresser which is said to be simple to operate and accurate in performance.

An automatic device has been developed which is pre-set to give the correct dosage of chemical powder to correspond with the quantity of seed going through the mixing apparatus. This will maintain the correct proportion against any fluctuation in the throughput of the cleaner and grader feeding the dresser. Alternatively, the seed is introduced into the injector by gravity feed, and here again the proportion of powder and seed will be maintained within close limits of accuracy. A high degree of industrial security is ensured while the machine is in operation by the fact that the powder container, powder-injecting and seed-weighing devices and the mixing cylinder are all totally enclosed, thus preventing the dissemination of undesirable dust.

The dresser is so designed that it may be easily attached to existing 'Petkus' cleaners and graders, even to the older models, as well as being available as an extra with new machines.

The sample from the cleaner and grader is fed into the dresser through a special inclined chute, supplied as standard equipment for this purpose, thus obviating the necessity for a separate elevator.

The 'Petkus' chemical powder dresser is also available for use as an independent machine, in which case it is equipped with a strongly constructed feed hopper and may be driven either by its own built in electric motor or may take its power supply from some other source, such as existing transmission shafting.

Rotary Cutter

The Texas company of E. L. Caldwell and Sons is now introducing its new S-2S rotary cutter, its distinguishing feature being the 'Flexo' swinging blade. Basically, the machine is identical to the S-2 model machine, but, unlike the S-2, the blades of the S-2S fold into a tight circle when an obstruction, such as a concealed stump or an embedded rock, is contacted. Model S-2 has a fixed blade assembly and, while breakage is guarded against by shear pins, the machine has not the latitude of safety offered by the S-2S, according to the manufacturers. The entire blade, or blades, are mounted on a heavy-duty spindle with a high centre clearance and when an obstruction is encountered the entire blade, and not just its tips, folds a full 90°. After the obstruction is passed, centrifugal force brings the blades back into their normal cutting position. All S-2 cutters now in use can be converted to an S-2S.

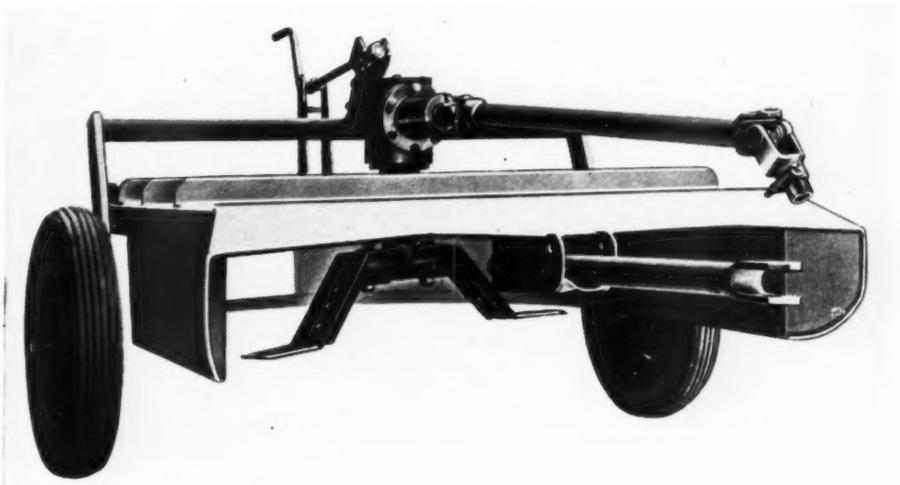
Bringing out the S-2S raises the number of Caldwell's rotary models to eight, the cutting widths ranging from 57 in. to 12 ft. All models, with the exception of the 'Elco Junior' and the S-3 and S-4, are completely gear driven.

The automatic chemical powder dresser which is described on this page

Ford Expansion Programme

Sir Patrick Hennessy, deputy chairman and managing director of Ford Motor Co. Ltd., recently announced a £65 million expansion programme which in the next five years will greatly increase the company's productive capacity. He said: 'Current production, in the region of 1,300 cars, commercial vehicles and tractors daily, is double our performance of five years ago, yet demand for our comprehensive range of products continues to outpace our capacity to supply. To meet this situation we are increasing floor space by about 4 million sq. ft. in all and are modernising and re-equipping existing facilities in the light of the most up-to-date techniques.'

The programme includes the construction of a new foundry and press shop and large expansion to manufacturing and assembly facilities.



The new rotary cutter which is being produced by a Texas firm

Some of the delegates who attended the third annual Dorman Sprayer Co. distributors' conference. Mr. A. K. Dorman, B.Sc., A.M.I.Mech.E., M.I.B.A.E., managing director of the company, is standing in the centre of the group. On his right is Mr. G. Huckle, sales manager of Shell Chemicals Ltd.

Tractor Mounted Crane

To enable the hay and corn harvest to be completed in the shortest time and with the minimum amount of labour Salopian Engineers Ltd. have recently added an interesting new model to their well-known range of harvesting machinery and equipment.

This is the Salopian tractor-mounted crane, a swinging crane ideal for lifting and loading bales and sacks, particularly at harvest time. It is of strong tubular steel construction and can be easily fitted to the existing hydraulic linkage of Fordson Major, Nuffield, Ferguson and similar tractors. Designed for speedy operation by a two-man team, the crane has a maximum lift of 11 ft. at any angle. Illustrated literature on the tractor-mounted crane is available on request to the manufacturers.

Tractor-Mounted Air Compressor

The Ferguson 'Hydrovane 60' compressor, which was shown recently, is carried on a single tubular steel and light alloy mounting connected to the tractor by three-point linkage. A belt drive is established through the Ferguson pulley attachment from the tractor power take-off shaft. The compressor is an important development of the eccentric rotor sliding vane type used with great success and reliability as a *low-pressure* machine. This type of compressor suffered from increasing inefficiency as pressures rose above a few lb. per sq. in. due to lack of internal sealing. Consequently, its use was restricted severely. The new 'Hydrovane' compressor eliminates this disadvantage by employing large volume oil lubrication to provide the necessary sealing for high-pressure operation. In addition, the oil carries away the heat of compression and enables the attainment of full working pressure in a single stage.

It is stated that remarkable fuel economy and reduced wear of tractor engine and compressor result from a special control system. The engine governor setting is varied automatically to maintain a compressor speed only sufficient to meet the demands for compressed air. The compressor, therefore, operates at a constant pressure under varying loads.

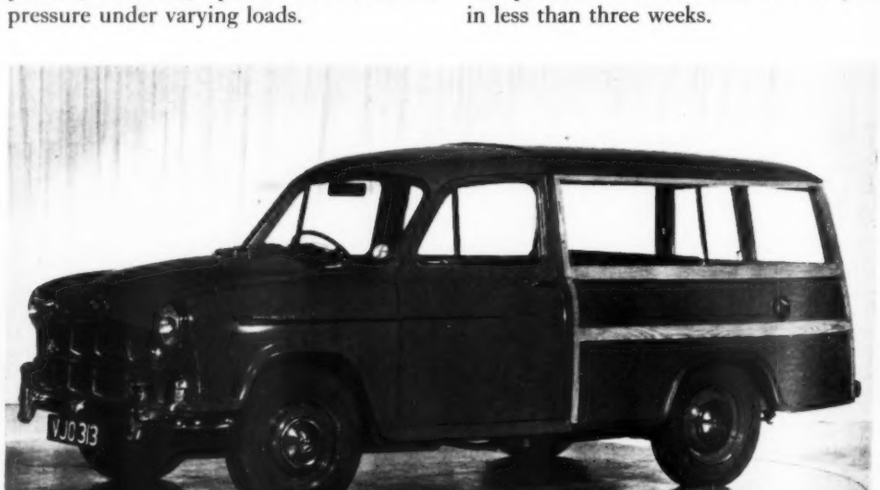
Should the permissible reduction in engine speed by this method be insufficient to balance the reduced air demand, a separate governor device within the compressor itself comes into operation automatically to provide stepless control down to nil delivery.

The 'Hydrovane' compressor is stated to be simple and robust. The primary moving parts consist of a slotted cylindrical rotor carrying a number of vanes having free radial movement within the slots and held in contact with the stator by centrifugal force. Flood lubrication means minimum wear, whilst that occurring at the blade tips is compensated automatically. Oil removal from the air stream is simple and undertaken without the use of a filter medium needing frequent renewal.

Bracken Clearance Tests

A series of tests to clear bracken and undergrowth have been carried out with the Clifford rotary cultivator Mark IV, which is produced by Clifford Aero and Auto Ltd. The machine was exhibited at the Royal Show at Windsor, but before and since has been put through tests in various parts of the country.

At Cannock Chase, Staffordshire, the Clifford tackled thick undergrowth—a mixture of blackberry, briar and bracken—on land that had laid fallow for many years. Working often on a gradient of 1 in 4 in., the machine cut the 5-ft. tangle, chopped it up, ploughed the land and buried the rubbish. At the first time over, it is stated to have effectively destroyed most of the roots, and in a working day of six hours to have cleared 10 acres of this scrubland and produced an even tilth of 6 or 7 in. in less than three weeks.



The new Morris Oxford 'Traveller,' which was exhibited at the Motor Show in London, is likely to be of interest to those in overseas territories

WORLD CROP REPORTS

WORLD

Coffee production. World production of green coffee for the marketing year 1954-55 is forecast at 41.7 million bags (of 132.276 lb. each), compared with 41.4 million bags (revised) for 1953-54 and 40.8 million bags (revised) for 1952-53. The total forecast for 1954-55 exceeds the post-war (1946-47/1950-51) average of 36.9 million bags by 13% and is slightly larger than the pre-war (1935-36/1939-40) average of 41.6 million bags.

World exportable production of coffee may exceed 33.8 million bags for the marketing season 1954-55, compared with 33.5 million bags for 1953-54 and 32.6 million bags during 1952-53. It is indicated that distribution of coffee in producing countries fell from about 8.2 million bags in 1952-53 to less than 7.9 million bags in 1953-54, as many producers pushed exports at the expense of home consumption.

The forecast for 1954-55 and the revised estimate for 1953-54 bring more clearly into focus the following factors of importance to coffee consumers: (1) there was no decline in total world production following the 1952-53 marketing season despite the Brazilian frost of July 1953; (2) there was no significant decline in Western Hemisphere coffee production (important to the United States consumer) following the 1952-53 marketing season; (3) total world production for the 1953-54 marketing season exceeded current world consumption of about 40.4 million bags; and (4) the marketing season 1954-55 should be the last season during which a close balance exists between world production and world consumption. The excess of future production over consumption will depend largely upon the extent to which Brazilian production recovers from the July 1953 frost damage and the extent to which world consumption reacts to price declines.

The forecast for the current marketing season reflects in part a good crop year in the biennial cycle of coffee production for many producing areas. However, the slightly increased total world production, despite a setback to production in Brazil, reflects more strongly the increased plantings of the post-war period, particularly those which followed the price rise of 1949-50. These plantings are moving now into production and promise to maintain world output above world requirements after the 1954-55 season.

Foreign Crops and Markets.

WEST GERMANY

Grain harvest. Latest official estimates put this year's West German grain harvest at 12,400,000 metric tons, almost 500,000 tons more than in 1953. The loss caused by the wet, cold weather in the past months is estimated at about 600,000 tons.

It is stated that rye and mixed summer and winter grain yields are higher this year than in 1953, while yield from wheat, barley and oats is lower.

This year's harvest is expected to include 4,010,000 tons of rye, 2,870,000 tons of wheat, 189,000 tons of mixed winter grain, 1,920,000 tons of barley, 2,510,000 tons of oats and 870,000 tons of mixed summer grain.

ENGLAND AND WALES

Agricultural report. Agricultural conditions in England and Wales on October 1, 1954, have been reported by the Ministry of Agriculture.

Progress was made during September with the harvesting of corn crops, but at the end of the month much still remained to be done. Estimates of yields per acre made on October 1 are lower than last year's yields, but about the same as the average for the five years 1949-1953 inclusive. Haymaking also was still incomplete at the end of September. Blight on potatoes was widespread and had affected tubers in some areas; the yield per acre is expected to be lower than last year, but about equal to the five-year average. Other root crops are also expected to yield less than last year and a little less than the five-year average. Because of the prolonged corn harvest a start had been made with autumn cultivations in a few areas only. Livestock, except hill sheep, have done well.

The weather was changeable and rather cool, with some high winds. There was much rain in Western districts, but considerable sunny periods in Eastern districts.

Corn crops. In the Eastern counties, the harvest was approaching completion at the end of the month, but elsewhere, although a large part of the corn had been harvested, much still remained to be done.

Wheat. The quality of the grain was generally only fair. Take-all was reported from many parts. The yield was expected to be 22.3 cwt. per acre, as compared with a yield of 24 cwt. per acre in 1953 and the five-year average of 22.3 cwt. per acre.

Barley. Quality of the grain was fair to poor. Some smut was reported. The yield was estimated at 20.6 cwt. per acre (1953, 22.6 cwt. per acre; five-year average, 20.5 cwt. per acre).

Oats. The quality was reported to be fair to poor and the yield was estimated at 18.7 cwt. per acre (1953, 21.2 cwt. per acre; five-year average, 19.3 cwt. per acre).

Other crops. The forecast of yields per acre made on October 1 is shown in Table 1:

TABLE 1

	Forecast of 1954 yield	*1953 yield*	*Average yield for 1949-53*
	cwt.	*cwt.*	*cwt.*
Mixed corn ..	19.0	21.0	19.3
Rye	18.9	19.6	17.9
Beans for stock-feeding ..	16.4	17.8	16.9
Peas for stock-feeding ..	10.3	15.9	14.4
Threshed peas for human consumption	7.8	13.3	15.5

Potatoes. A slow start had been made with lifting main crop potatoes in a good number of counties, but there were many counties where a start had not been made. Blight was reported to be widespread and affected tubers in some areas. The yield of second early and main crop potatoes was estimated at 8.5 tons per acre (1953, 9.3 tons per acre; five-year average, 8.4 tons per acre).

Sugar beet. Lifting of sugar beet had begun in a few counties. Growth had been generally good, but there were reports of virus yellows from many places. The yield of roots per acre was expected to be about average.

Roots. Turnips made satisfactory progress during the month, but they were reported to be weedy. Reports were similar for swedes, but mildew was mentioned in a few areas. The combined yield of turnips and swedes was estimated at 14.9 tons per acre (1953, 17.8 tons per acre; five-year average, 14.7 tons per acre).

Mangolds were satisfactory, but virus yellows was reported in one or two areas. The yield was expected to be 21 tons per acre (1953, 25.7 tons per acre; five-year average, 22.8 tons per acre).

Fodder beet was generally satisfactory, but virus yellows was reported in this crop also.

Very little stubble cleaning had been done; cultivations generally were delayed by the late harvest and little progress had been made.

Conditions for harvesting crops grown specifically for seed were bad and yields were expected to be below average.

Hay. Over wide areas, particularly in the north and west, haymaking was not complete. The yield estimates made on September 1, which indicated below average yields, may need to be further reduced, especially since some fields had to be

abandoned. Feeding quality, already forecast as below average, had further deteriorated.

Pastures. Leys sown in late summer had taken well and had made good growth. Leys sown last spring (including ' seeds ') had generally done well, except where they had been checked by laid corn. Other leys had made good growth. Permanent pastures were in good condition and continued to provide plenty of grass.

SUDAN

Crop report. We have received the following report on August crop conditions from the Ministry of Agriculture, Khartoum:

Cotton

Sudan Gezira Board. Pre-sowing rainfall (July 1 to August 15) was average and rains favourable during the sowing period, except in centre and part of south groups, where heavy rains caused flooding and subsequent resowing. The general cool conditions, however, gave good germination; cotton sowing was well up to programme and 231,260 feddans, 98% of the proposed area, had been sown by the end of August. Weeds were no problem and cleaning of crops was well and early done.

Gash. The Gash flood has been moderate with few and erratic flushes and a tendency for the river to move east away from the control and distribution works. 17,000 feddans were watered by the end of July and 40,000 by the end of August, compared with 33,000 and 65,500 in 1953.

Tokar. The Baraka flood is poor and 15,000 acres only were allocated for cotton at the end of August.

Nuba Mountains. The demand from cultivators for seed was heavy and 96,000 kantars (of 100 lb.) of seed were issued, an increase of 16,000 kantars on 1953-54. Rains are variable, but the crop appears generally well established and to be making good growth.

Equatoria Projects Board Areas. Although growth is good with some of the earlier cotton-producing buds, the majority of the cotton was late sown and the standard of weeding is poor. First estimates show a fall of 15% to 20% in the area sown (last year's acreage was 17,000 acres).

Dura (great millet). Irrigated dura on Blue and White Nile areas got away to a good start on rain. The Gezira area has 115,380 acres. The few reports available on rain-growth dura indicate extensive crops sown; not only have rains been good, but ' harigs ' (cultivation by burning grass) have been widespread and private mechanised cultivation has increased in the Gedaref area of Kassala Province. The export of last year's heavy crop has encouraged growers: 56,250 tons of the 1953-54 crop were exported in the first six months of 1954, compared to 33,600 in the previous year.

Oil seeds. The sesame crop in Kordofan is classed as ' not promising,' but a big increase even over last year's record is forecast in Gedaref district. Groundnuts in Kordofan were sown over a larger area than 1953-54 and got away to a good start with heavy rains. Last year's record production may well be exceeded.

Nile flood. A high flood has inundated wide areas. Surveys are in progress, but considerable damage to irrigated schemes and orchards in Khartoum and Northern Provinces is feared. Vegetables, fruit and the summer crops sown for home consumption are most likely to be affected. Chick peas and haricot beans are likely to be sown to a much greater extent than last season after this heavy flood.

Locust. There have been numerous swarms and hopper bands throughout the summer. Energetic measures of the locust control section of this Ministry has prevented serious damage.

INDIA

Rape and mustard seed. India's rape and mustard seed crop was down slightly in 1953-54 from the preceding season despite an overall increase in acreage. Final estimates place production at 925,000 short tons from 5,373,000 acres against 937,000 tons from 5,199,000 acres in 1952-53. The decline in output, which occurred mainly in the states of Uttar Pradesh, West Bengal and Bihar, was due to unfavourable weather conditions during the growing season. Increases in production were registered in Punjab, Patiala and East Punjab States Union (P.E.P.S.U.) and Rajasthan.

Flax seed production in India also declined slightly in 1953-54 to 14,200,000 bushels from 3,369,000 acres, as compared with 14,360,000 bushels from 3,395,000 acres in 1952-53. The smaller production resulted largely from declines recorded in the states of Uttar Pradesh, Hyderabad and Rajasthan and was attributed to decreases in acreage and to adverse weather conditions during the period of crop growth.

ISRAEL

Groundnut harvest. The harvesting of groundnuts had begun in October and it was reported that the crop is of high quality. During recent years the groundnuts crop was greatly harmed by agricultural pests. Techniques for preserving crops against the ravages of plant killers have, however, been developed lately. In addition, production costs have greatly decreased, owing to the introduction of improved production methods and savings on irrigation. The groundnut industry, moreover, provides many man-days, especially in harvesting.

Many settlements have concluded contracts with marketing companies. The minimum prices to be paid for groundnuts under these contracts will be IL.450 per ton. An additional amount will be paid after the crop is sorted and after it is known how much will be exported and at what price. Prices higher than the minimum price have already been offered, since many merchants are interested in undertaking the risks of exporting groundnuts.

Experiments with several types of machinery designed to narrow production costs are being made. Among these machines are groundnut combines and machines for taking groundnuts out of the ground. It is expected that the introduction of these machines on a large scale will revolutionise the Israeli groundnut industry.

Citrus prospects. There is still wide scope for additional citrus groves, a special inquiry on behalf of the Ministry of Agriculture indicates. Taking into account the marketing experience of the thirties, it has been calculated that the maximum yield in foreign currency may be attained from an export of about 10 million crates of oranges and 1.8 million crates of grapefruit, grown on about 150,000 to 180,000 dunams of orange groves and 20,000 dunams of grapefruit.

At present some 165,000 dunams are under citrus. Out of this, about 35,000 dunams were planted during the past two years and are not yet bearing fruit. At least 30,000 dunams more are expected to be planted during the next agricultural year.

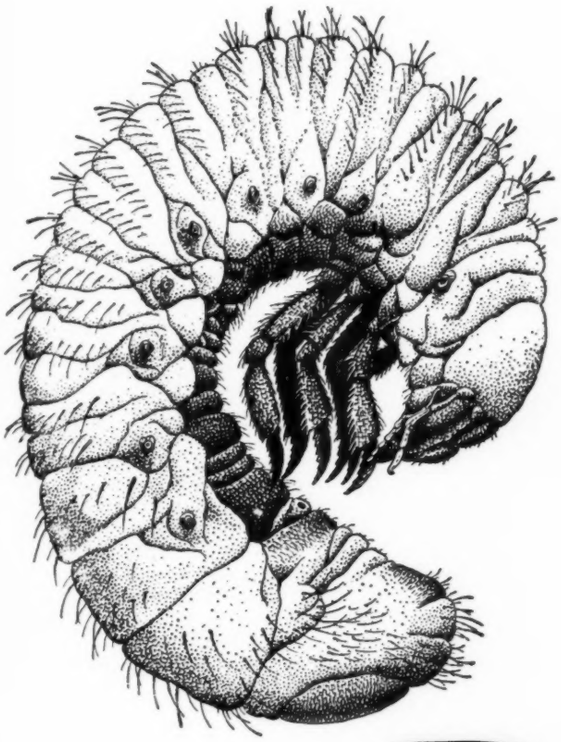
AUSTRIA

Sugar beet. It is reported that the campaign generally was proceeding smoothly, although in some areas heavy conditions were hampering lifting operations. Slicing commenced on October 11.

Yields, both as regards weight and sugar content, are lower than last year, but it is thought that Austria's 1955 sugar requirements will be fully met without recourse to open market supplies. Current stocks are expected to be sufficient to last until the end of this year, whilst the estimated production of 160,000 metric tons, white sugar value, will probably fall short of next year's consumption by no more than about 20,000 tons. As under a trade pact Cuba is scheduled to provide 10,000 tons of raw sugar next year and Iron Curtain countries will also be supplying sugar within the framework of commercial agreements, this small deficit will be more than made up.

Czarnikow's Sugar Review, No. 171.

White Grub (*Phyllophaga and Melolontha spp.*)



NEW fighting weapons for agriculture

The majority of agricultural pests are doomed, now that two new Shell insecticides, *aldrin* and *dieldrin*, have entered the battle to grow more food.

Of these new pest destroyers, *aldrin* is the one to use against white grubs. Dust *aldrin* over the soil before sowing cereals, root crops including potatoes, or grasses; or spray the soil with *aldrin* during cultivation.

In the soil *aldrin* retains its insecticidal potency for long periods: it will not taint a crop: it is alkali-stable.

aldrin

dieldrin

FULL INFORMATION
FROM YOUR LOCAL
SHELL COMPANY

are SHELL insecticides

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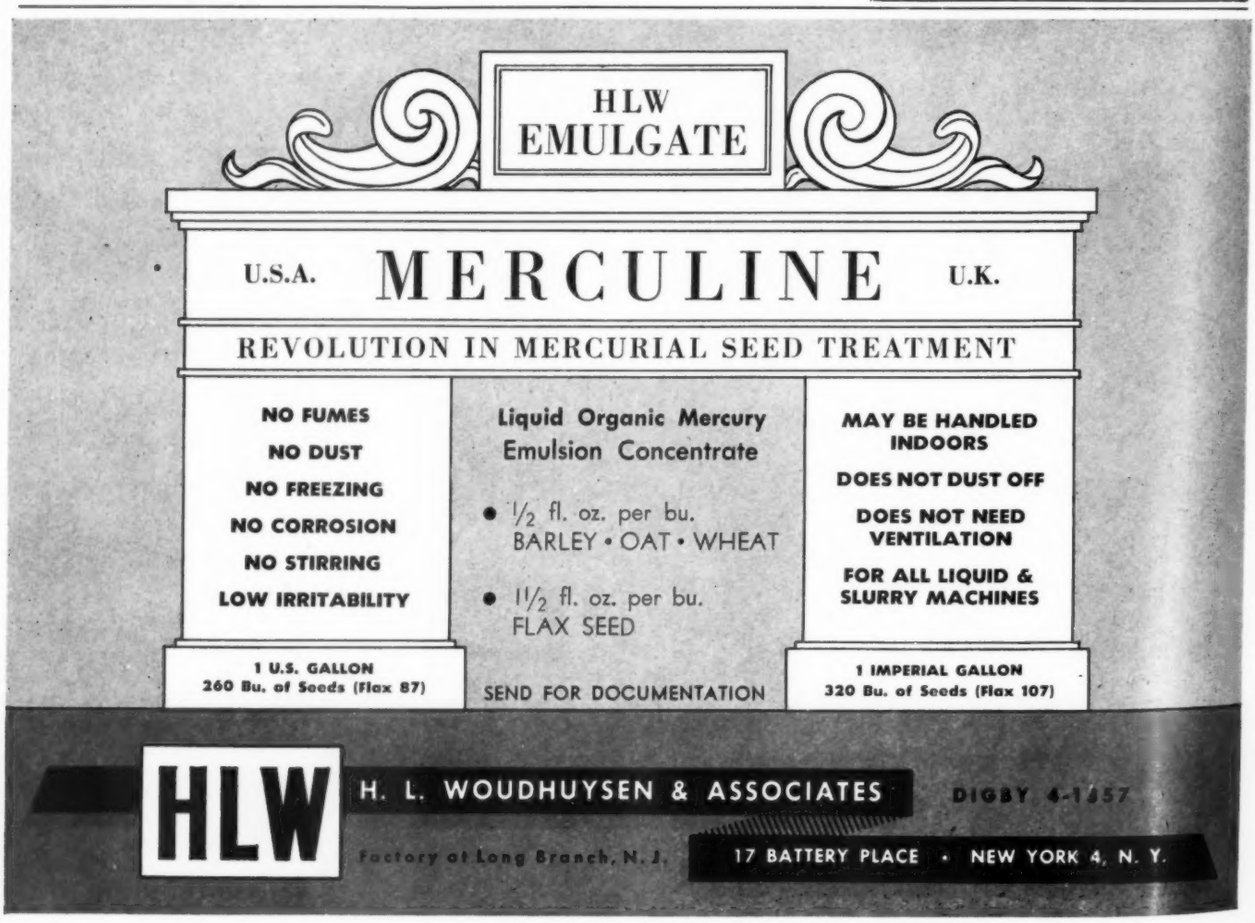
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MERCULINE
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REVOLUTION IN MERCURIAL SEED TREATMENT
NO FUMES
NO DUST
NO FREEZING
NO CORROSION
NO STIRRING
LOW IRRITABILITY
Liquid Organic Mercury Emulsion Concentrate
• ½ fl. oz. per bu. BARLEY • OAT • WHEAT
• 1½ fl. oz. per bu. FLAX SEED
SEND FOR DOCUMENTATION
MAY BE HANDLED INDOORS
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FOR ALL LIQUID & SLURRY MACHINES
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1 IMPERIAL GALLON 320 Bu. of Seeds (Flax 107)
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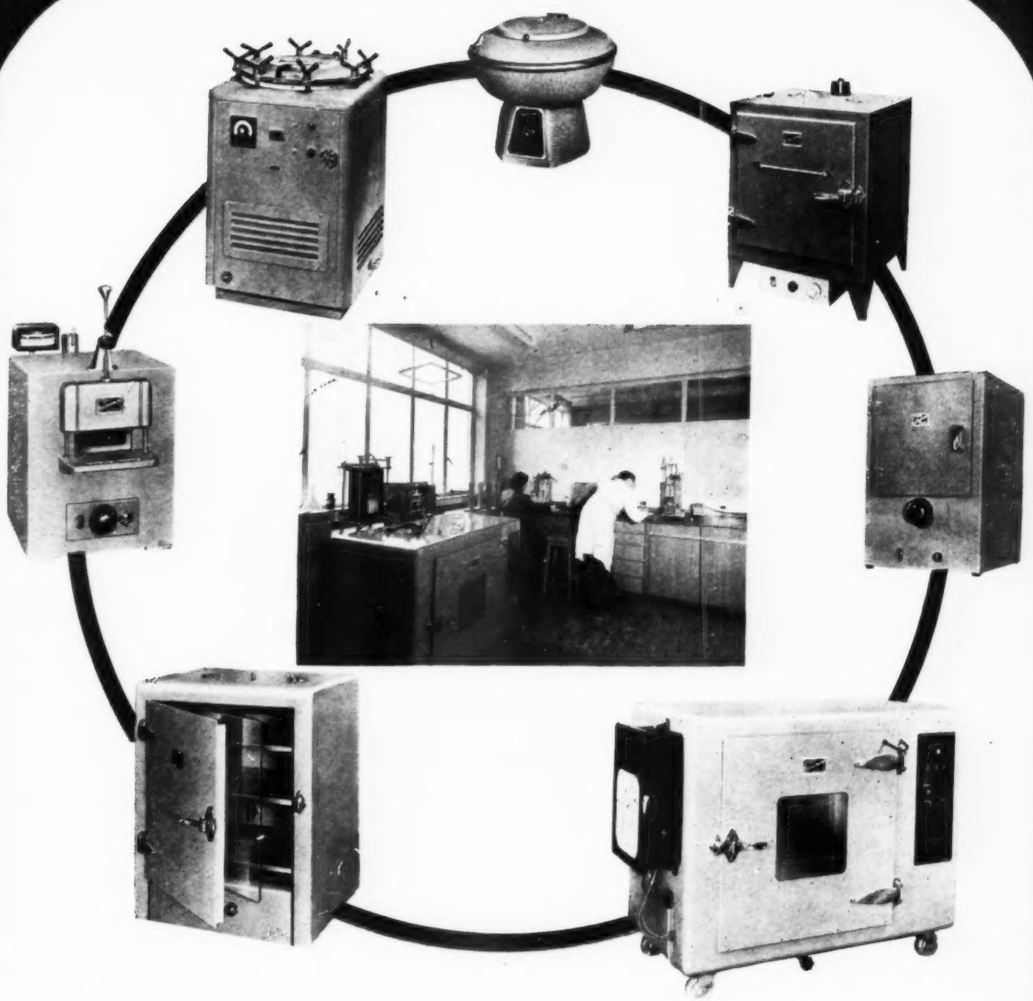

Our Specialities include . . .

OVENS - INCUBATORS - CENTRIFUGES - WATER-BATHS - STIRRERS
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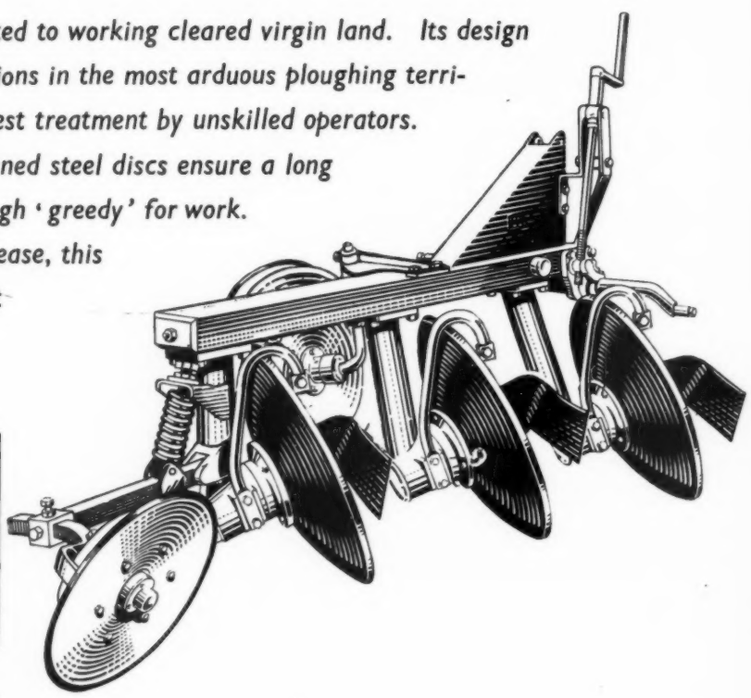
your enquiries are invited

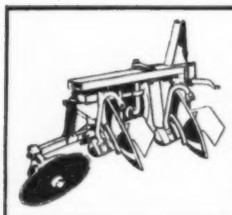
A. GALLENKAMP & CO. LTD.,
17 - 29 SUN STREET, LONDON, E.C.2

TELEPHONE : BISHOPSGATE 0651 (9 LINES)
TELEGRAMS : GALLENKAMP AVE LONDON
CABLES : GALLENKAMP LONDON

For the really tough jobs!

Here is a Three-Disc Plough ideally suited to working cleared virgin land. Its design has been developed under actual conditions in the most arduous ploughing territories where it has withstood the toughest treatment by unskilled operators. Simple to operate and adjust, the hardened steel discs ensure a long life and are set so as to render the plough 'greedy' for work. It will plough to a depth of 10 in. with ease, this being controlled by a simple adjustment to the land wheel.





The two-disc plough is similar to its larger brother and was developed for the smaller wheeled tractor, fitted with three-point hydraulic linkage.

HUDSON

MOUNTED DISC PLOUGHS

KENNETH HUDSON & SON, DARLASTON, SOUTH STAFFS, ENGLAND

London Office and Export Department:

KENT HOUSE MARKET PLACE OXFORD CIRCUS, LONDON, W.1

Cotton grows in England

. . . but not more than could go to make a handkerchief or two. A few plants are brought to maturity under glass and are subjected to attacks from various pests and diseases so that new chemical treatments can be tested. They are the constant concern of specialist research workers at the Fernhurst Research Station of Plant Protection Ltd.

Final testing must, of course, be carried out on the actual crops. But the aim is always to *save time* so that results of early research can be put into operation and their benefits be made available to farmers and growers as soon as possible.

'GUINEA-PIGS' SAVE A YEAR'S CROP

A season gained may save the growers considerable losses and, whenever possible, preliminary research is done at Fernhurst to give guidance to the collaborators who will continue the research overseas.

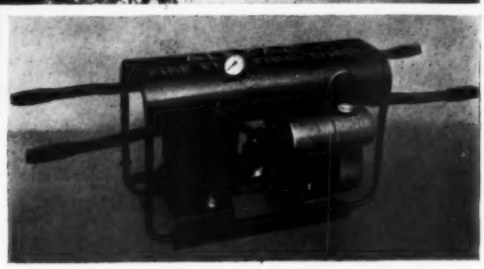
That is why these 'guinea-pig' cotton plants are grown at Fernhurst *between* seasons. It is hoped that they will save a whole year in the fight against certain fungi, and result in valuable crop increases.

FINDING NEW WAYS

The help of Plant Protection Ltd, backed by the enormous resources of its parent company Imperial Chemical Industries, is welcomed by many overseas government authorities in seeking solutions to their particular agricultural problems; and Fernhurst research workers make frequent visits overseas to investigate these problems on the spot.

PLANT PROTECTION LTD

ALLMAN PORTABLE FIRE FIGHTER



FOR MAXIMUM FIRE CONTROL from MINIMUM AMOUNT OF WATER

This unit is a highly effective fire-fighting machine, readily handled by two men. It can be brought into operation instantly and, by the application of high-pressure water fog, uses only one-tenth of the water usually needed by other methods. By putting water under high pressure it is broken into fine particles that closely approximate cold steam size. The value of very finely atomised water is its ability to absorb great heat at a very rapid rate. The specially designed gun applies from a solid jet of water to a high-pressure fog, and is equipped with face and body spray to protect the operator from the intense heat and to allow him to approach the fire much more closely.

ALLMAN UNIVERSAL MODEL 100

The most advanced sprayer on the market. Can be supplied for hydraulic mounting or as a trailer machine. Capacity 100 gallons. The ideal machine for weed and pest control over large acreages. New 3 section boom for spraying 20 ft. width. Also for 30 ft. width.

ALLMAN GENIMEC MODEL 40

A low/medium volume sprayer, tractor mounted, with 40 gallon galvanised barrel. R.V.10 Rollervane Pump gives pressure up to 100 lbs. p.s.i., depending on size of nozzles. Fitted with Genimec control valve. NEW 3 section boom gives spraying width of 218 inches.

ALLMAN SPRAYALL 50 ACID AND FIELD SPRAYER

A low/medium volume machine for spraying acids, and for field work, with 50 gallon BRASS tank. The special R.V.10 Rollervane Pump is cast in ni-resist and all parts in contact with acid are acid-resisting. The NEW 3 section boom is made of copper.

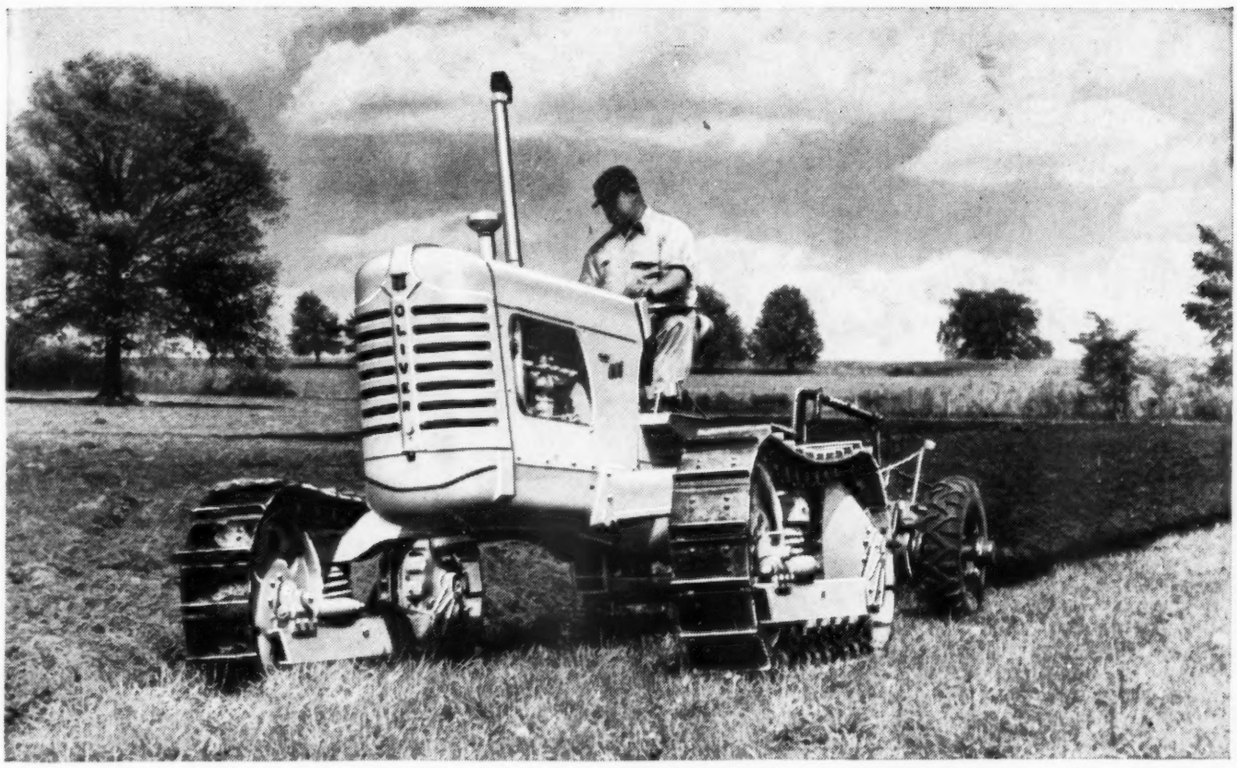
ALLMAN REDSHAW FERTILISER ECONOMISER

For ribbon sowing—four or five rows. Originated to economise in the use of artificial fertilisers without decreasing the yield per acre. Savings are known up to 50%. Fits all popular tractors. The drill and/or steerage hoe can be used at the same time thus completing two operations at once.

Write for illustrated leaflets giving detailed information of these and other machines in the Allman range.

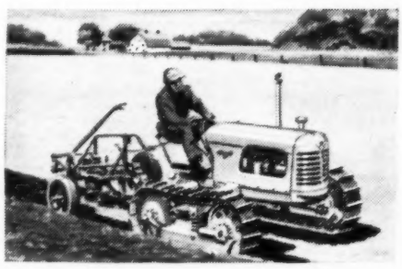
E. ALLMAN & CO. LTD.

BIRDHAM ROAD · CHICHESTER · SUSSEX · ENGLAND Tel. Birdham 353/5



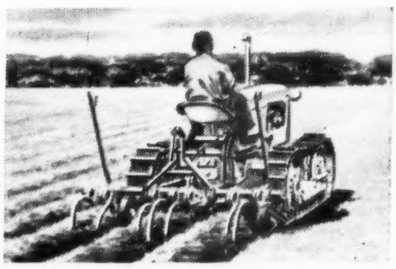
It's here! the NEW OLIVER "OC-6"

the all-purpose farm crawler with everything you want

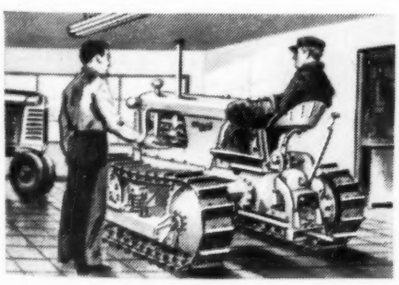


Power! The new "OC-6" is a full 3-plow machine, powered to take your heavy jobs in stride. It's *smooth* power, *6-cylinder* power—gasoline or diesel!

Speed Range! Take your choice of six speeds forward, two reverse. You can gear this Oliver down to a creep—open her up to nine m.p.h.!



Versatility! Tread widths for every job: 68, 60, 42, 32 inches. High clearance for your row crops. Three-point hitch plus tool bar and attachments.

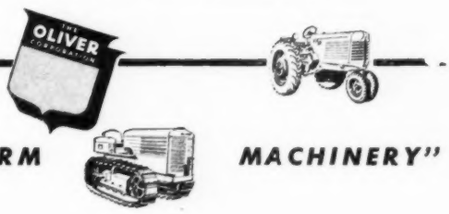


Everything! Hydraulic control? Yes! Direct Drive PTO? Yes! Stop in, look it over...*everything* you want in a crawler, you'll find in the "OC-6."

see your OLIVER distributor

THE OLIVER CORPORATION

Export Division: 400 West Madison Street, Chicago 6, Illinois, U.S.A.



"FINEST IN FARM MACHINERY"

Power... Versatility... Economy...

make UNIVERSAL demand world-wide

As the need for increased production grows, so does the world demand for the Nuffield Universal Tractor. Combining power and economy with rugged strength and greater efficiency this versatile tractor will carry out farm jobs more easily in less time; it will work profitably on any type of farm, no matter what the nature of the soil or the climatic conditions of the country. Let a Nuffield Universal prove itself on your land with your implements. Arrange a demonstration to-day!

Choice of three engines—Petrol, Vaporising Oil and New Diesel

—and now the

NEW

B.M.C. 4-CYLINDER

DIESEL..

3.4 litre direct injection engine develops 45 b.h.p. at flywheel and virtually eliminates "diesel knock" and low-speed "surge". Thorough tests prove easier starting at low temperatures without heating accessories. Centrifugal pump and thermostat give quick warm-up and ideal working temperature.

This great new engine saves both upkeep costs and man hours with extra power, smoother running, easier starting and better cooling.

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UNIVERSAL
TRACTORS

BMC — The British Motor Corporation Limited

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• big economies in copper and • sulphur

new ways with bordeaux mixtures, etc.

Late blight of potatoes can be controlled with organo-mercury compounds alone. At the same time there are many troubles where an organo-mercury may be a co-partner in, for instance, bordeaux mixtures or sulphur preparations—improving the fungicidal power and offering a big economy, since the equivalent of 1 lb. of mercury will save 75 to 100 lbs. of copper or 100 to 200 lbs. of sulphur. This new technique with old friends appears to have big possibilities and we shall be happy to advise.

We also make wettable powders such as D.D.T., Lindane and Sulphur

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THE MERCURY SPECIALISTS

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and at Tilgate Research Station, Sussex

turns waste vegetation into rich humus—in a few weeks only!

FERTOSAN MYCO

This remarkably rapid and economical accelerator has been specially developed for use with tough, fibrous tropical and semi-tropical crops, and is ideal for composting sawdust. Full details on request.

AGRICULTURALISTS throughout the world have proved the value of Fertosan Compost Accelerator on farms and plantations. This highly efficient organic preparation is the quickest, simplest and most economical compost maker. It rapidly decomposes even the toughest and stringiest waste vegetation, and provides the natural means to increased soil fertility. A pile of waste vegetation sprinkled with Fertosan becomes rich humus in a few weeks, without further watering or turning. Fertosan is available in units to make 100, 60, 20, 4 tons or 1 ton of compost. Write TODAY for generous Samples and Terms.

FERTOSAN LTD. (Dept. 27), WOLVERHAMPTON, ENGLAND. *Agencies throughout the principal countries of the World*

PIPER is the World's Principal Builder of Agricultural Aircraft

Piper Aircraft Corporation builds more aircraft especially designed for the aerial application of agricultural chemicals than all other aircraft manufacturers in the world combined. This stems from the fact that the Piper PA-18-A duster and sprayer is the most ideally suited agricultural plane—reliable, safe, efficient and economical.

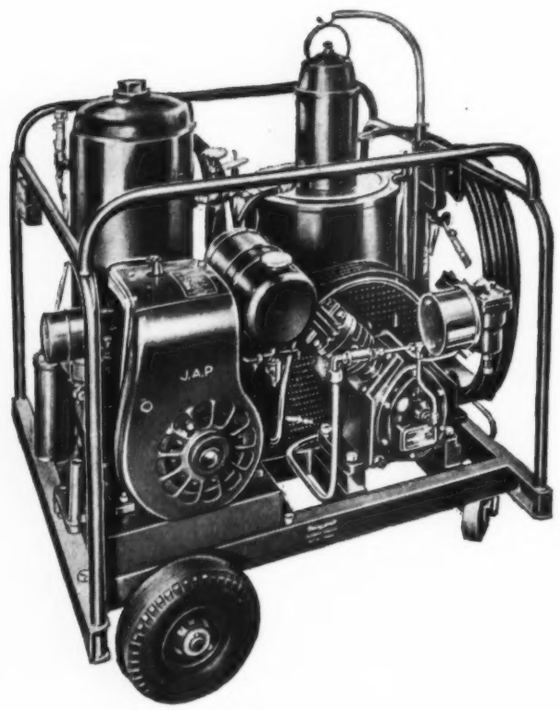
The Piper PA-18-A has been proven in virtually every part of the world and today is in wide use in 34 different countries. Owners find they can operate this rugged plane in remote and isolated areas, far from service facilities, with confidence that it will perform day in and day out with virtually no maintenance. Little wonder, because the design has been refined and continually perfected from the experience of building more than 37,000 Pipers which have flown millions of hours in peace and combat.

THE PIPER PA-18-A is available as a duster, sprayer or a combination unit quickly convertible for use either with dry or liquid chemicals. Its capacity is 18 cubic feet or 110 gallons. Application of liquids can be adjusted from one-half to 15 gallons per acre. It can be maneuvered as slowly as 40 mph, is equipped with flaps for short take-offs and landings and has many safety features such as superior pilot vision, shoulder harness and wire cutter on landing gear. Power is a dependable 135 hp Lycoming engine. Send for complete brochure describing this remarkable airplane.

PIPER
AIRCRAFT CORPORATION
Lock Haven, Pa., U.S.A.

Routine maintenance jobs cost you more than the servicing charges! They cost you the time wasted while your tractors and machinery are in the service bay, waiting their turn for attention. By servicing your equipment on the spot you can save those lost hours, lost opportunities for improving your yield.

Own the new Tecalemit "Tectruk" Servicing Unit!



The "TECTRUK" Servicing Unit with units powered by a petrol driven J.A.P. model 4/3 engine. Electrically powered model also available.

SAVE MORE THAN HALF THE MONEY AND TIME SPENT ON ROUTINE MACHINERY SERVICING

With the "Tectruk" your men can carry out routine lubrication and servicing jobs on the spot faster and cheaper and just as efficiently as in the service bay. In most cases, the time and labour charges saved by "Tectruk" servicing will amount to 50 per cent or more of the usual cost of maintenance.

WHAT THE "TECTRUK" WILL DO FOR YOU

On the "Tectruk's" sturdy steel chassis are mounted an air-operated drum pump complete with hose and control valve, a penetrating oil sprayer, a tyre inflator, and a two-stage air compressor.

The drum pump unit gives the power for efficient high pressure lubrication. The spring sprayer attends to the springs and similar exposed lubrication jobs. The air compressor can be used for tyre inflation and plug cleaning, for paint spraying on both buildings and vehicles, for spraying insecticides and weed-killer, and for operating pneumatic tools.

EXTRA PROFIT

"Tectruk" servicing enables you to cut down idle time, to get more out of your equipment every month. From the regular, extra profit it brings you, the "Tectruk" will soon pay back its low initial cost!

Ask your usual Tecalemit distributor for further details, or write to:

TECALEMIT LIMITED
GREAT WEST ROAD · BRENTFORD · ENGLAND

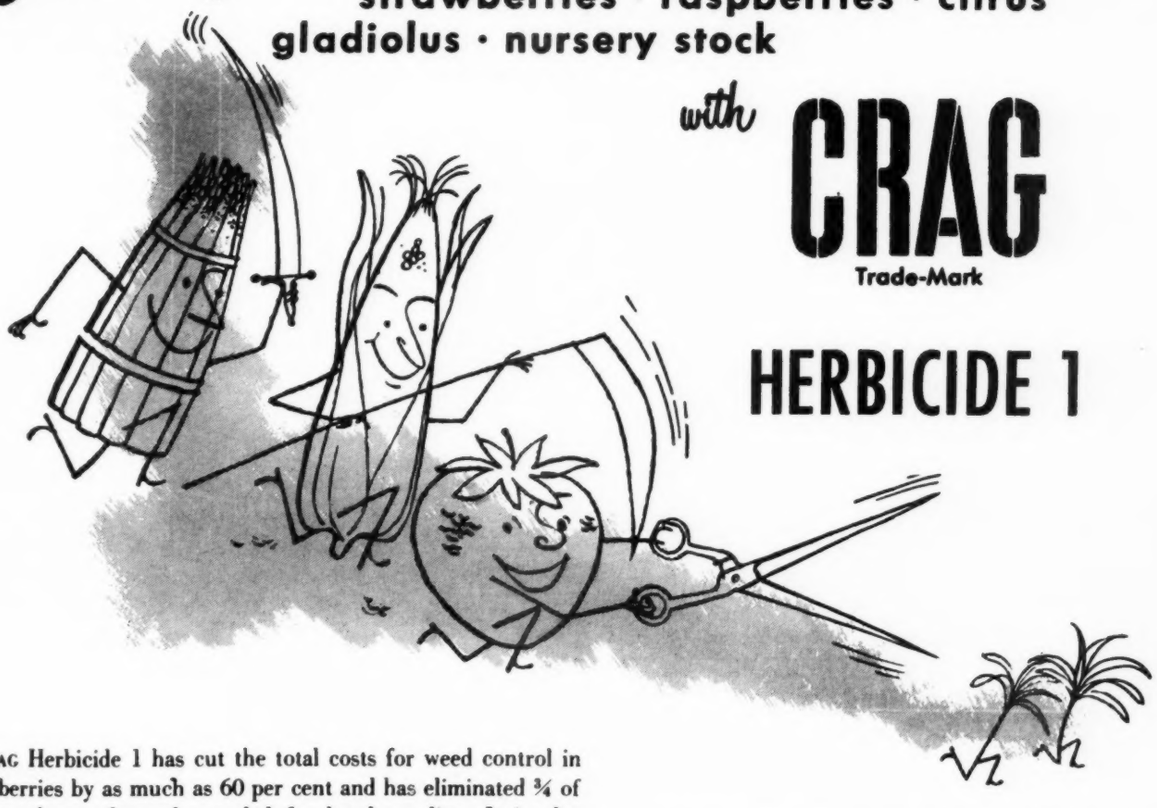
T460

Cut your Weeding Costs

IN
strawberries · raspberries · citrus
gladiolus · nursery stock

with **CRAG**
Trade-Mark

HERBICIDE 1



CRAG Herbicide 1 has cut the total costs for weed control in strawberries by as much as 60 per cent and has eliminated ¾ of the man-hours formerly needed for hand weeding. It is also being used extensively on raspberries, gladiolus, corn, asparagus, and nursery stock. In addition to saving labor, CRAG Herbicide 1 aids in increasing crop yields by conserving moisture and plant food through weed prevention. Control of weeds and grasses lasts for three to six weeks.

CRAG Herbicide 1 helps reduce the weeding problem in non-cultivated citrus groves. In experiment station tests and grower trials, fall treatments have prevented weeds in such groves for two months, when used at rates of four to six pounds per acre.

CRAG Herbicide 1 is a new kind of weed killer. After contact with moist soil, it becomes a powerful killer of germinating weed seeds. In a few hours, bacteria in the soil change it from a material that is harmless to foliage, to one that kills germinating weed seeds. Because it is not active upon foliage of established plants there is little or no drift hazard using CRAG Herbicide 1.

For a Free illustrated folder on CRAG Herbicide 1, Write to:

"Crag" is a trade-mark of Union Carbide and Carbon Corporation.

PROTECT FOR PROFIT WITH

Chemicals Department

UNION CARBIDE INTERNATIONAL COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

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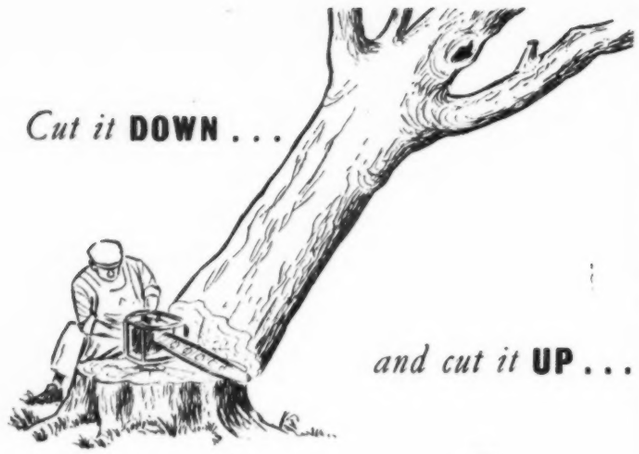
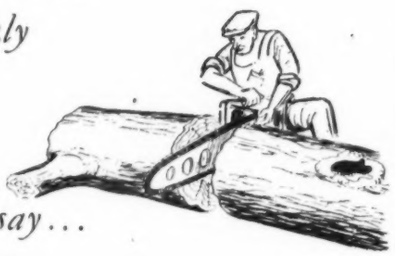


Cut it **DOWN . . .**

and cut it **UP . . .**

almost as quickly

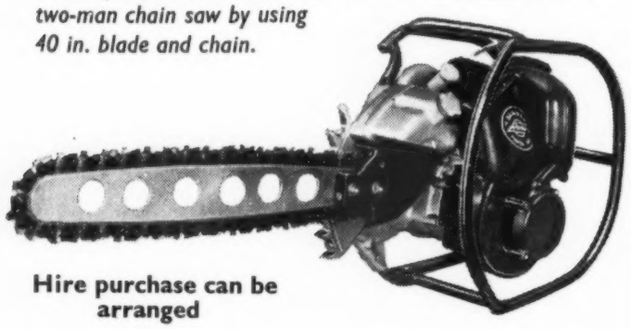


as you can say . . .

SANKEY-ASPIN
ONE MAN CHAIN SAW!

The SANKEY-ASPIN one-man chain saw will make light work of the toughest felling job. Thousands of these sturdy yet amazingly portable machines are now being used and have won an unique reputation for safe, effortless and efficient sawing. The SANKEY-ASPIN saw is fitted with the 'Cutesa' self-feeding chain, centrifugal automatic clutch, and rewind starter. 100% British manufacture.

An unique feature is that this saw can be converted to a two-man chain saw by using 40 in. blade and chain.



Hire purchase can be arranged

Write now for further details, Dept. E.D.8

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THE Association, which was established in 1877, includes in its membership the principal manufacturers of Agricultural Machinery and other concerns engaged in engineering activities in Great Britain.

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The
AGRICULTURAL ENGINEERS ASSOCIATION

(HOME AND EXPORT DIVISIONS)

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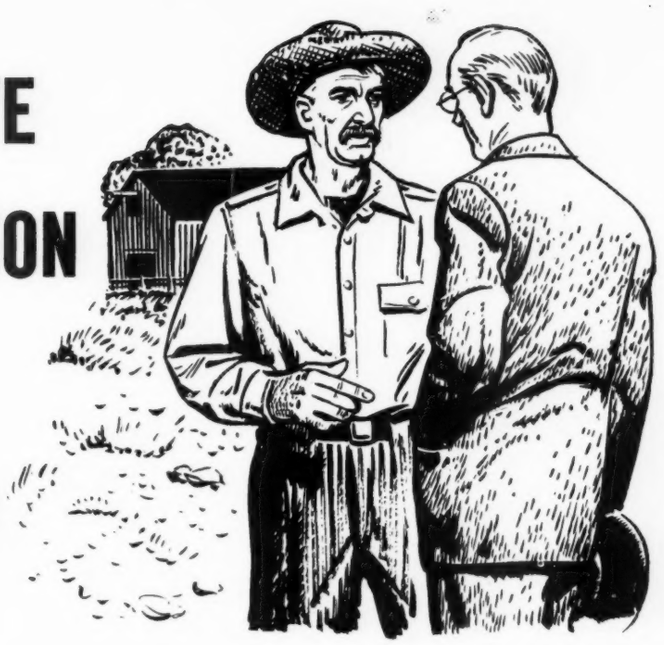

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Peru ..... W. R. Grace, Lima
Philippine Islands ..... Western Merchandising Corporation, Manila
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South Africa...Industrial Chemical Products S.A. (Pty.) Ltd., Johannesburg
Spain ..... Supram, Sdad. Ama., Barcelona
Sweden ..... Gullviks Fabriks Aktiebolag, Malmo
Switzerland ..... Dr. R. Maag A. G., Zurich
Uruguay ..... " Quimur " Cia, Química Uruguaya, S.A., Montevideo
Venezuela ..... Andres Francheschi V., Caracas

ment to the sugar industry and the reversal, to a large extent, of the recommendation of the Royal Commission of 1909, which would appear to have been so abundantly justified by events.

Although this may be obscure, no one will do otherwise than wish the new organisation well. The report gives a brief indication of the proposed structure of the new institute, which in a colony such as Mauritius—which is largely dependent on sugar and is ever likely to remain so by reason of the natural conditions—seems bound to assume in time many of the functions previously performed by the Department of Agriculture.

It is certainly good to find an industry like the Mauritius sugar industry so appreciative of the benefits which it has derived from research as to be willing to shoulder the cost of many activities which previously had been met from Government resources.

H.T.

Agricultural Report of the Alabama Polytechnic Institute for 1953

We have received a copy of this report, which is divided into a number of sections, including agricultural economics, botany and plant pathology, poultry, husbandry and also entomology. The staff of the station is a large one and comprises over 100 graduate officers in the various divisions. The work is obviously closely related to the agricultural needs of the state which it is designed to serve.

Annual Report of the Department of Science and Agriculture, Barbados, for 1951-52

This report covers the activities of the Department of Agriculture for the year 1951-52. The rainfall in the period was markedly above the average and this resulted in an abundant sugar crop which amounted to 187,643 tons and greatly exceeded production in any of the six preceding years. The area under sugar cane amounted to 44,739 acres, of which some 8,500 acres were smallholders' canes. The manner in which the area under smallholders' canes has increased is a feature of recent years. It is also worthy of note that peasant cane yields fall little, if at all, short of those obtained on estates. In this regard, Barbados is in notable contrast to most cane-growing countries and is an effective comment on the skill and good cultivation of peasant growers in the island.

The work of the Department includes investigations on the manuring of sugar cane, soil moisture studies with a view to extending irrigation. The campaign for the control of moth borers of sugar cane by the distribution of the egg parasite *Trichogramma* was continued, while experiments for the control of melolonthid grubs by the use of Gammexane and Aldrin have given promising results. Animal husbandry and animal health are included in the work of the Department; the former continues to grow in importance.

Obviously, the work of the Department is continuing to expand in importance and is having a marked influence on agriculture in the colony.

National Institute of Agricultural Botany Annual Report

The N.I.A.B. has recently published its 34th annual report, for the year ended December 31, 1953. This describes the year as one of steady progress, with some consolidation and preparation for further development.

As usual, the report includes interim comments on the performance of the many varieties of crops in trials. These include, for example, notes on some 70 different varieties of cereals as well as comments on varieties or strains of roots and fodder crops, beans and peas, vegetables and potatoes.

The report also includes reference to other aspects of the institute's work. Particular mention may be made of the enquiries into the feeding value of oat straw, the best time of cutting and the leaf/stem ratio in lucerne, the effects of growth regulator sprays on the development of the flowers in grasses, and the classification and identification of grasses, clovers and lucernes.

Malayan Rubber News

World production of rubber in 1953 amounted to 1,720,000 tons, of which 574,400 tons, or 33%, came from the 3,746,000 acres planted to this crop in Malaya. The value of net exports of rubber from that country in 1953 was £112,700,000. Exports were mainly to the United Kingdom (209,000 tons) and the United States (182,000 tons). Amongst other countries importing rubber from this source were France (69,000 tons), Germany (54,000 tons), Japan (52,000 tons) Italy (44,000 tons), Canada (33,000 tons) and Australia (30,000 tons).

Asians own 62% of the area planted with rubber in Malaya. Much of this is in small holdings (under 100 acres) owned by Malays. Of the larger estates (over 100 acres), Chinese own 468,000 acres and Indians 113,000 acres. Of estates of 100 acres and over, 521 are owned by public limited liability companies and 2,001 by private limited liability companies and private owners. The area held by the former totals over 1,100,000 acres and by the latter 933,000 acres, but, whereas almost all the limited liability companies are European controlled, 1,255 of the privately owned estates and companies are owned by Chinese and only 480 estates by Europeans.

For some years there has been a gradual replacement of old trees by selected high-yielding material. The area so planted is now 730,000 acres. The average yield per acre from high-yielding budded or clonal stock was 841 lb. per acre on European estates (slightly less on Asian-owned estates), as compared with 372 lb. per acre from unselected stock.

Great care is taken to meet the requirements of manufacturers. Whereas in the early days of the industry rubber was marketed either as smoked sheet or crepe, at the present time it is exported in many forms of sheet, crepe and latex. A further development of this nature was introduced in 1949, in which year an international scheme was inaugurated to market natural rubber according to its technical qualities. The physical properties are determined by regular tests at central testing stations on samples of rubber from estates, packing houses and remilling factories. Red, yellow or blue circles are stencilled on bales of this technically classified rubber (T.C.R.), indicating low, medium or high modulus rubber respectively, and thus providing useful information to the consumer.

(*Malaya Rubber Statistics Handbook*, 1953.)

Dr. Cardon's Visit

Dr. P. V. Cardon, Director-General of the Food and Agriculture Organisation of the United Nations, recently visited England. He met the Minister of Agriculture and Fisheries, the Rt. Hon. D. Heathcoat Amory, M.P.; the Joint Parliamentary Secretary, Mr. G. R. H. Nugent, M.P.; Dr. Charles Hill, M.P., Parliamentary Secretary, Ministry of Food; and the Earl of Munster, Parliamentary Under-Secretary of State, Colonial Office.

Dr. Cardon addressed the annual meeting of the British Association for the Advancement of Science at Oxford and also gave an address at a meeting in London arranged by the United Nations Association. During his stay he saw something of British farming and of the various activities of the National Agricultural Advisory Service.

FARM MACHINERY

Hooded Flame Gun

The use of flame throwers in agriculture has hitherto not attained any very great popularity, mainly by reason of the obvious risks of damage to crops or by the causation of widespread and uncontrollable bush fires. Controlled flame weeding has, however, attained popularity in the cotton growing areas of the United States, while recently the use of flame guns for weeding in other countries is extending. C. B. McAllen (Engineers) Ltd. have for some years manufactured apparatus of this type in England and are now marketing a 'Hooded Flame' machine.

The addition of the hood to the McAllen 'Paramajor' flame gun manufactured by them is said to concentrate a flame and the heat (2,000°F.) generated by it to an extent impossible with any other type of flame gun. This enables operators to traverse the ground more quickly, while the hood confines the heat and flame to such an extent that the machine can be walked, it is claimed, between the rows of row crops or soft fruit bushes to control weeds without risk of damage to the growing crop.

Automatic Chemical Powder Dresser

One of the best insurances against disease in plants is to dress the seeds with a suitable preparation in powder form. There is now available as an attachment to the 'Petkus' grain and seed cleaners and graders a chemical powder dresser which is said to be simple to operate and accurate in performance.

An automatic device has been developed which is pre-set to give the correct dosage of chemical powder to correspond with the quantity of seed going through the mixing apparatus. This will maintain the correct proportion against any fluctuation in the throughput of the cleaner and grader feeding the dresser. Alternatively, the seed is introduced into the injector by gravity feed, and here again the proportion of powder and seed will be maintained within close limits of accuracy. A high degree of industrial security is ensured while the machine is in operation by the fact that the powder container, powder-injecting and seed-weighing devices and the mixing cylinder are all totally enclosed, thus preventing the dissemination of undesirable dust.

The dresser is so designed that it may be easily attached to existing 'Petkus' cleaners and graders, even to the older models, as well as being available as an extra with new machines.

The sample from the cleaner and grader is fed into the dresser through a special inclined chute, supplied as standard equipment for this purpose, thus obviating the necessity for a separate elevator.

The 'Petkus' chemical powder dresser is also available for use as an independent machine, in which case it is equipped with a strongly constructed feed hopper and may be driven either by its own built in electric motor or may take its power supply from some other source, such as existing transmission shafting.

Rotary Cutter

The Texas company of E. L. Caldwell and Sons is now introducing its new S-2S rotary cutter, its distinguishing feature being the 'Flexo' swinging blade. Basically, the machine is identical to the S-2 model machine, but, unlike the S-2, the blades of the S-2S fold into a tight circle when an obstruction, such as a concealed stump or an embedded rock, is contacted. Model S-2 has a fixed blade assembly and, while breakage is guarded against by shear pins, the machine has not the latitude of safety offered by the S-2S, according to the manufacturers. The entire blade, or blades, are mounted on a heavy-duty spindle with a high centre clearance and when an obstruction is encountered the entire blade, and not just its tips, folds a full 90°. After the obstruction is passed, centrifugal force brings the blades back into their normal cutting position. All S-2 cutters now in use can be converted to an S-2S.

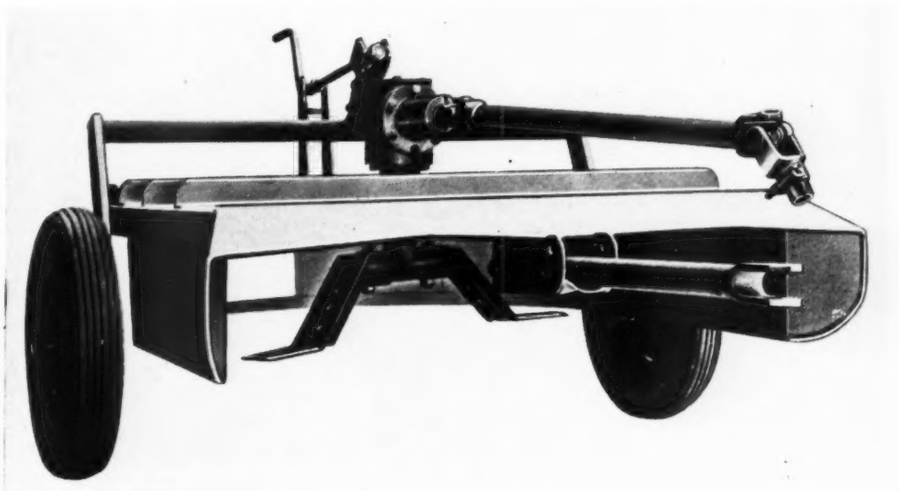
Bringing out the S-2S raises the number of Caldwell's rotary models to eight, the cutting widths ranging from 57 in. to 12 ft. All models, with the exception of the 'Elco Junior' and the S-3 and S-4, are completely gear driven.

The automatic chemical powder dresser which is described on this page

Ford Expansion Programme

Sir Patrick Hennessy, deputy chairman and managing director of Ford Motor Co. Ltd., recently announced a £65 million expansion programme which in the next five years will greatly increase the company's productive capacity. He said: 'Current production, in the region of 1,300 cars, commercial vehicles and tractors daily, is double our performance of five years ago, yet demand for our comprehensive range of products continues to outpace our capacity to supply. To meet this situation we are increasing floor space by about 4 million sq. ft. in all and are modernising and re-equipping existing facilities in the light of the most up-to-date techniques.'

The programme includes the construction of a new foundry and press shop and large expansion to manufacturing and assembly facilities.



The new rotary cutter which is being produced by a Texas firm

Some of the delegates who attended the third annual Dorman Sprayer Co. distributors' conference. Mr. A. K. Dorman, B.Sc., A.M.I.Mech.E., M.I.B.A.E., managing director of the company, is standing in the centre of the group. On his right is Mr. G. Huckle, sales manager of Shell Chemicals Ltd.

Tractor Mounted Crane

To enable the hay and corn harvest to be completed in the shortest time and with the minimum amount of labour Salopian Engineers Ltd. have recently added an interesting new model to their well-known range of harvesting machinery and equipment.

This is the Salopian tractor-mounted crane, a swinging crane ideal for lifting and loading bales and sacks, particularly at harvest time. It is of strong tubular steel construction and can be easily fitted to the existing hydraulic linkage of Fordson Major, Nuffield, Ferguson and similar tractors. Designed for speedy operation by a two-man team, the crane has a maximum lift of 11 ft. at any angle. Illustrated literature on the tractor-mounted crane is available on request to the manufacturers.

Tractor-Mounted Air Compressor

The Ferguson 'Hydrovane 60' compressor, which was shown recently, is carried on a single tubular steel and light alloy mounting connected to the tractor by three-point linkage. A belt drive is established through the Ferguson pulley attachment from the tractor power take-off shaft. The compressor is an important development of the eccentric rotor sliding vane type used with great success and reliability as a *low-pressure* machine. This type of compressor suffered from increasing inefficiency as pressures rose above a few lb. per sq. in. due to lack of internal sealing. Consequently, its use was restricted severely. The new 'Hydrovane' compressor eliminates this disadvantage by employing large volume oil lubrication to provide the necessary sealing for high-pressure operation. In addition, the oil carries away the heat of compression and enables the attainment of full working pressure in a single stage.

It is stated that remarkable fuel economy and reduced wear of tractor engine and compressor result from a special control system. The engine governor setting is varied automatically to maintain a compressor speed only sufficient to meet the demands for compressed air. The compressor, therefore, operates at a constant pressure under varying loads.

Should the permissible reduction in engine speed by this method be insufficient to balance the reduced air demand, a separate governor device within the compressor itself comes into operation automatically to provide stepless control down to nil delivery.

The 'Hydrovane' compressor is stated to be simple and robust. The primary moving parts consist of a slotted cylindrical rotor carrying a number of vanes having free radial movement within the slots and held in contact with the stator by centrifugal force. Flood lubrication means minimum wear, whilst that occurring at the blade tips is compensated automatically. Oil removal from the air stream is simple and undertaken without the use of a filter medium needing frequent renewal.

Bracken Clearance Tests

A series of tests to clear bracken and undergrowth have been carried out with the Clifford rotary cultivator Mark IV, which is produced by Clifford Aero and Auto Ltd. The machine was exhibited at the Royal Show at Windsor, but before and since has been put through tests in various parts of the country.

At Cannock Chase, Staffordshire, the Clifford tackled thick undergrowth—a mixture of blackberry, briar and bracken—on land that had laid fallow for many years. Working often on a gradient of 1 in 4 in., the machine cut the 5-ft. tangle, chopped it up, ploughed the land and buried the rubbish. At the first time over, it is stated to have effectively destroyed most of the roots, and in a working day of six hours to have cleared 10 acres of this scrubland and produced an even tilth of 6 or 7 in. in less than three weeks.

The new Morris Oxford 'Traveller,' which was exhibited at the Motor Show in London, is likely to be of interest to those in overseas territories

WORLD CROP REPORTS

WORLD

Coffee production. World production of green coffee for the marketing year 1954-55 is forecast at 41.7 million bags (of 132.276 lb. each), compared with 41.4 million bags (revised) for 1953-54 and 40.8 million bags (revised) for 1952-53. The total forecast for 1954-55 exceeds the post-war (1946-47/1950-51) average of 36.9 million bags by 13% and is slightly larger than the pre-war (1935-36/1939-40) average of 41.6 million bags.

World exportable production of coffee may exceed 33.8 million bags for the marketing season 1954-55, compared with 33.5 million bags for 1953-54 and 32.6 million bags during 1952-53. It is indicated that distribution of coffee in producing countries fell from about 8.2 million bags in 1952-53 to less than 7.9 million bags in 1953-54, as many producers pushed exports at the expense of home consumption.

The forecast for 1954-55 and the revised estimate for 1953-54 bring more clearly into focus the following factors of importance to coffee consumers: (1) there was no decline in total world production following the 1952-53 marketing season despite the Brazilian frost of July 1953; (2) there was no significant decline in Western Hemisphere coffee production (important to the United States consumer) following the 1952-53 marketing season; (3) total world production for the 1953-54 marketing season exceeded current world consumption of about 40.4 million bags; and (4) the marketing season 1954-55 should be the last season during which a close balance exists between world production and world consumption. The excess of future production over consumption will depend largely upon the extent to which Brazilian production recovers from the July 1953 frost damage and the extent to which world consumption reacts to price declines.

The forecast for the current marketing season reflects in part a good crop year in the biennial cycle of coffee production for many producing areas. However, the slightly increased total world production, despite a setback to production in Brazil, reflects more strongly the increased plantings of the post-war period, particularly those which followed the price rise of 1949-50. These plantings are moving now into production and promise to maintain world output above world requirements after the 1954-55 season.

Foreign Crops and Markets.

WEST GERMANY

Grain harvest. Latest official estimates put this year's West German grain harvest at 12,400,000 metric tons, almost 500,000 tons more than in 1953. The loss caused by the wet, cold weather in the past months is estimated at about 600,000 tons.

It is stated that rye and mixed summer and winter grain yields are higher this year than in 1953, while yield from wheat, barley and oats is lower.

This year's harvest is expected to include 4,010,000 tons of rye, 2,870,000 tons of wheat, 189,000 tons of mixed winter grain, 1,920,000 tons of barley, 2,510,000 tons of oats and 870,000 tons of mixed summer grain.

ENGLAND AND WALES

Agricultural report. Agricultural conditions in England and Wales on October 1, 1954, have been reported by the Ministry of Agriculture.

Progress was made during September with the harvesting of corn crops, but at the end of the month much still remained to be done. Estimates of yields per acre made on October 1 are lower than last year's yields, but about the same as the average for the five years 1949-1953 inclusive. Haymaking also was still incomplete at the end of September. Blight on potatoes was widespread and had affected tubers in some areas; the yield per acre is expected to be lower than last year, but about equal to the five-year average. Other root crops are also expected to yield less than last year and a little less than the five-year average. Because of the prolonged corn harvest a start had been made with autumn cultivations in a few areas only. Livestock, except hill sheep, have done well.

The weather was changeable and rather cool, with some high winds. There was much rain in Western districts, but considerable sunny periods in Eastern districts.

Corn crops. In the Eastern counties, the harvest was approaching completion at the end of the month, but elsewhere, although a large part of the corn had been harvested, much still remained to be done.

Wheat. The quality of the grain was generally only fair. Take-all was reported from many parts. The yield was expected to be 22.3 cwt. per acre, as compared with a yield of 24 cwt. per acre in 1953 and the five-year average of 22.3 cwt. per acre.

Barley. Quality of the grain was fair to poor. Some smut was reported. The yield was estimated at 20.6 cwt. per acre (1953, 22.6 cwt. per acre; five-year average, 20.5 cwt. per acre).

Oats. The quality was reported to be fair to poor and the yield was estimated at 18.7 cwt. per acre (1953, 21.2 cwt. per acre; five-year average, 19.3 cwt. per acre).

Other crops. The forecast of yields per acre made on October 1 is shown in Table 1:

TABLE 1

	Forecast of 1954 yield	*1953 yield*	*Average yield for 1949-53*
	cwt.	*cwt.*	*cwt.*
Mixed corn ..	19.0	21.0	19.3
Rye	18.9	19.6	17.9
Beans for stock-feeding ..	16.4	17.8	16.9
Peas for stock-feeding ..	10.3	15.9	14.4
Threshed peas for human consumption	7.8	13.3	15.5

Potatoes. A slow start had been made with lifting main crop potatoes in a good number of counties, but there were many counties where a start had not been made. Blight was reported to be widespread and affected tubers in some areas. The yield of second early and main crop potatoes was estimated at 8.5 tons per acre (1953, 9.3 tons per acre; five-year average, 8.4 tons per acre).

Sugar beet. Lifting of sugar beet had begun in a few counties. Growth had been generally good, but there were reports of virus yellows from many places. The yield of roots per acre was expected to be about average.

Roots. Turnips made satisfactory progress during the month, but they were reported to be weedy. Reports were similar for swedes, but mildew was mentioned in a few areas. The combined yield of turnips and swedes was estimated at 14.9 tons per acre (1953, 17.8 tons per acre; five-year average, 14.7 tons per acre).

Mangolds were satisfactory, but virus yellows was reported in one or two areas. The yield was expected to be 21 tons per acre (1953, 25.7 tons per acre; five-year average, 22.8 tons per acre).

Fodder beet was generally satisfactory, but virus yellows was reported in this crop also.

Very little stubble cleaning had been done; cultivations generally were delayed by the late harvest and little progress had been made.

Conditions for harvesting crops grown specifically for seed were bad and yields were expected to be below average.

Hay. Over wide areas, particularly in the north and west, haymaking was not complete. The yield estimates made on September 1, which indicated below average yields, may need to be further reduced, especially since some fields had to be

abandoned. Feeding quality, already forecast as below average, had further deteriorated.

Pastures. Leys sown in late summer had taken well and had made good growth. Leys sown last spring (including ' seeds ') had generally done well, except where they had been checked by laid corn. Other leys had made good growth. Permanent pastures were in good condition and continued to provide plenty of grass.

SUDAN

Crop report. We have received the following report on August crop conditions from the Ministry of Agriculture, Khartoum:

Cotton

Sudan Gezira Board. Pre-sowing rainfall (July 1 to August 15) was average and rains favourable during the sowing period, except in centre and part of south groups, where heavy rains caused flooding and subsequent resowing. The general cool conditions, however, gave good germination; cotton sowing was well up to programme and 231,260 feddans, 98% of the proposed area, had been sown by the end of August. Weeds were no problem and cleaning of crops was well and early done.

Gash. The Gash flood has been moderate with few and erratic flushes and a tendency for the river to move east away from the control and distribution works. 17,000 feddans were watered by the end of July and 40,000 by the end of August, compared with 33,000 and 65,500 in 1953.

Tokar. The Baraka flood is poor and 15,000 acres only were allocated for cotton at the end of August.

Nuba Mountains. The demand from cultivators for seed was heavy and 96,000 kantars (of 100 lb.) of seed were issued, an increase of 16,000 kantars on 1953-54. Rains are variable, but the crop appears generally well established and to be making good growth.

Equatoria Projects Board Areas. Although growth is good with some of the earlier cotton-producing buds, the majority of the cotton was late sown and the standard of weeding is poor. First estimates show a fall of 15% to 20% in the area sown (last year's acreage was 17,000 acres).

Dura (great millet). Irrigated dura on Blue and White Nile areas got away to a good start on rain. The Gezira area has 115,380 acres. The few reports available on rain-growth dura indicate extensive crops sown; not only have rains been good, but ' harigs ' (cultivation by burning grass) have been widespread and private mechanised cultivation has increased in the Gedaref area of Kassala Province. The export of last year's heavy crop has encouraged growers: 56,250 tons of the 1953-54 crop were exported in the first six months of 1954, compared to 33,600 in the previous year.

Oil seeds. The sesame crop in Kordofan is classed as ' not promising,' but a big increase even over last year's record is forecast in Gedaref district. Groundnuts in Kordofan were sown over a larger area than 1953-54 and got away to a good start with heavy rains. Last year's record production may well be exceeded.

Nile flood. A high flood has inundated wide areas. Surveys are in progress, but considerable damage to irrigated schemes and orchards in Khartoum and Northern Provinces is feared. Vegetables, fruit and the summer crops sown for home consumption are most likely to be affected. Chick peas and haricot beans are likely to be sown to a much greater extent than last season after this heavy flood.

Locust. There have been numerous swarms and hopper bands throughout the summer. Energetic measures of the locust control section of this Ministry has prevented serious damage.

INDIA

Rape and mustard seed. India's rape and mustard seed crop was down slightly in 1953-54 from the preceding season despite an overall increase in acreage. Final estimates place production at 925,000 short tons from 5,373,000 acres against 937,000 tons from 5,199,000 acres in 1952-53. The decline in output, which occurred mainly in the states of Uttar Pradesh, West Bengal and Bihar, was due to unfavourable weather conditions during the growing season. Increases in production were registered in Punjab, Patiala and East Punjab States Union (P.E.P.S.U.) and Rajasthan.

Flax seed production in India also declined slightly in 1953-54 to 14,200,000 bushels from 3,369,000 acres, as compared with 14,360,000 bushels from 3,395,000 acres in 1952-53. The smaller production resulted largely from declines recorded in the states of Uttar Pradesh, Hyderabad and Rajasthan and was attributed to decreases in acreage and to adverse weather conditions during the period of crop growth.

ISRAEL

Groundnut harvest. The harvesting of groundnuts had begun in October and it was reported that the crop is of high quality. During recent years the groundnuts crop was greatly harmed by agricultural pests. Techniques for preserving crops against the ravages of plant killers have, however, been developed lately. In addition, production costs have greatly decreased, owing to the introduction of improved production methods and savings on irrigation. The groundnut industry, moreover, provides many man-days, especially in harvesting.

Many settlements have concluded contracts with marketing companies. The minimum prices to be paid for groundnuts under these contracts will be IL.450 per ton. An additional amount will be paid after the crop is sorted and after it is known how much will be exported and at what price. Prices higher than the minimum price have already been offered, since many merchants are interested in undertaking the risks of exporting groundnuts.

Experiments with several types of machinery designed to narrow production costs are being made. Among these machines are groundnut combines and machines for taking groundnuts out of the ground. It is expected that the introduction of these machines on a large scale will revolutionise the Israeli groundnut industry.

Citrus prospects. There is still wide scope for additional citrus groves, a special inquiry on behalf of the Ministry of Agriculture indicates. Taking into account the marketing experience of the thirties, it has been calculated that the maximum yield in foreign currency may be attained from an export of about 10 million crates of oranges and 1.8 million crates of grapefruit, grown on about 150,000 to 180,000 dunams of orange groves and 20,000 dunams of grapefruit.

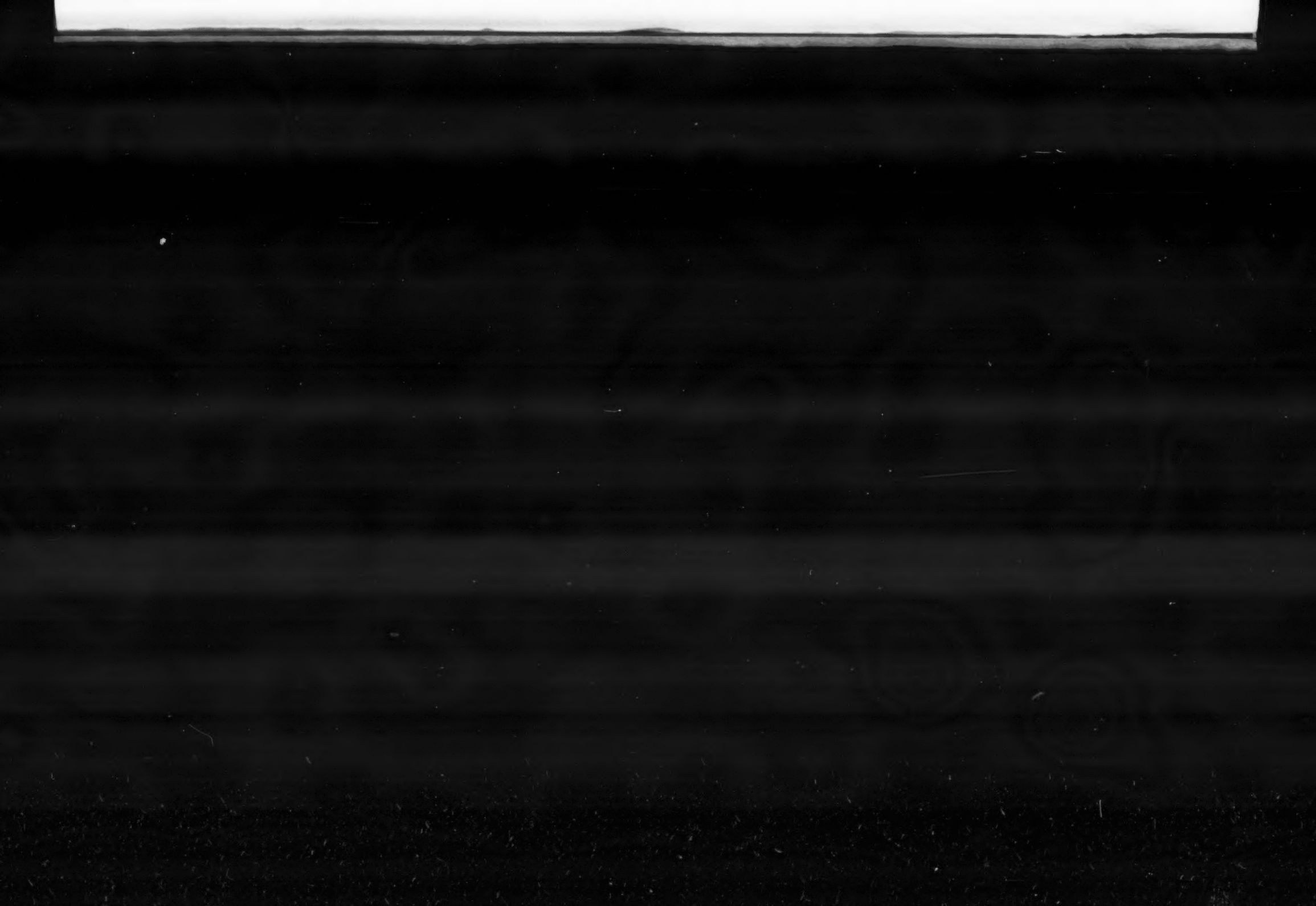
At present some 165,000 dunams are under citrus. Out of this, about 35,000 dunams were planted during the past two years and are not yet bearing fruit. At least 30,000 dunams more are expected to be planted during the next agricultural year.

AUSTRIA

Sugar beet. It is reported that the campaign generally was proceeding smoothly, although in some areas heavy conditions were hampering lifting operations. Slicing commenced on October 11.

Yields, both as regards weight and sugar content, are lower than last year, but it is thought that Austria's 1955 sugar requirements will be fully met without recourse to open market supplies. Current stocks are expected to be sufficient to last until the end of this year, whilst the estimated production of 160,000 metric tons, white sugar value, will probably fall short of next year's consumption by no more than about 20,000 tons. As under a trade pact Cuba is scheduled to provide 10,000 tons of raw sugar next year and Iron Curtain countries will also be supplying sugar within the framework of commercial agreements, this small deficit will be more than made up.

Czarnikow's Sugar Review, No. 171.



WORLD CROPS

VOLUME 6, 1954

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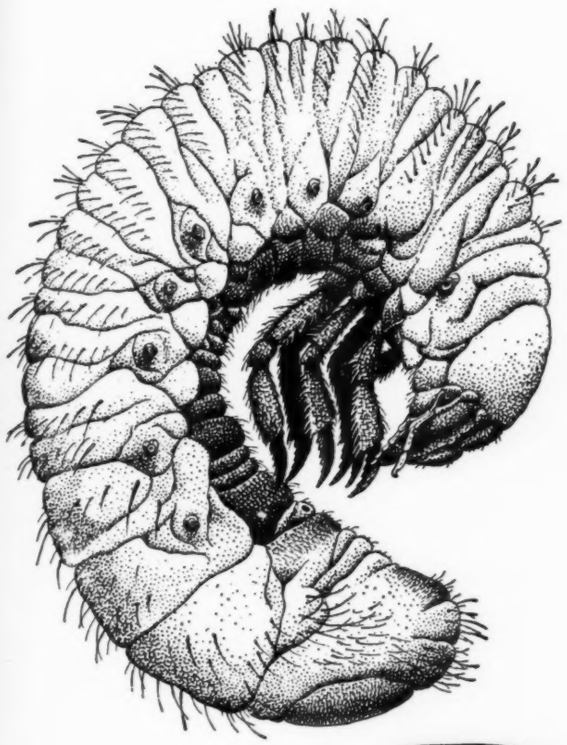
White Grub (*Phyllophaga and Melolontha spp.*)



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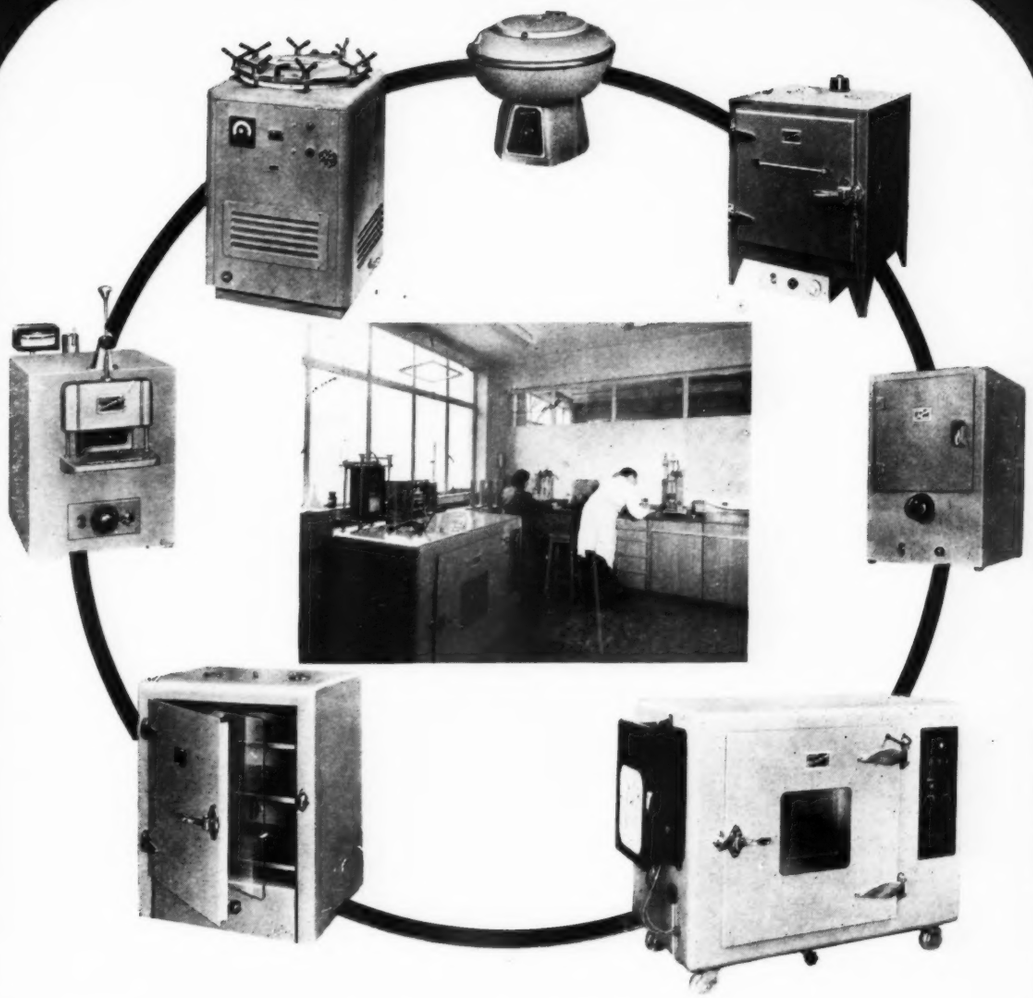

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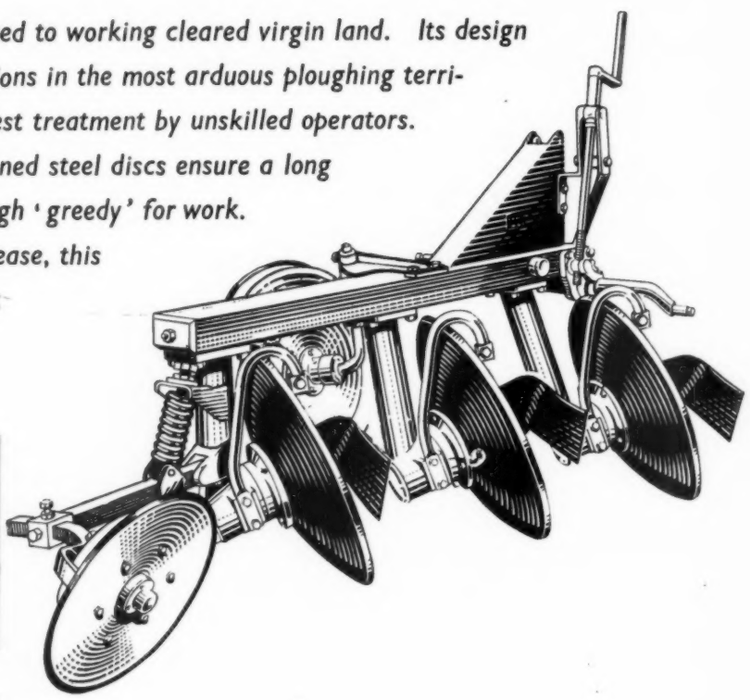

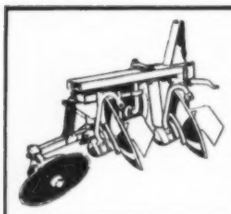

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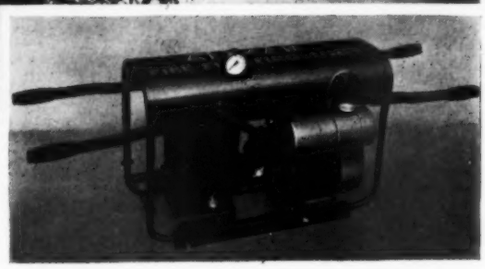

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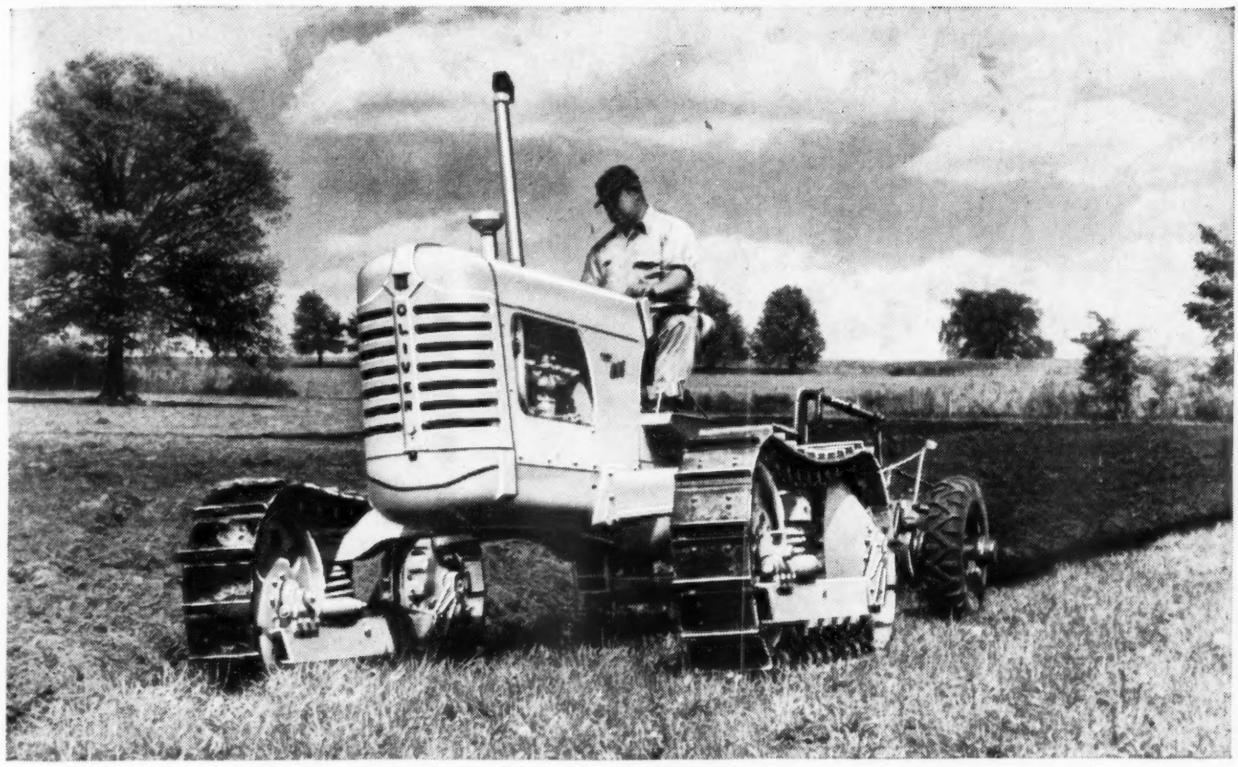

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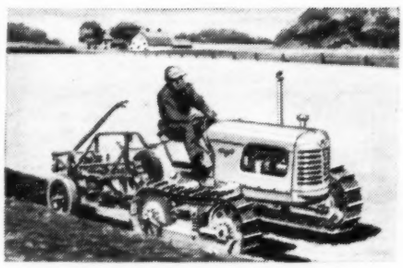

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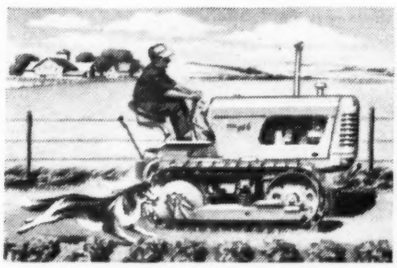

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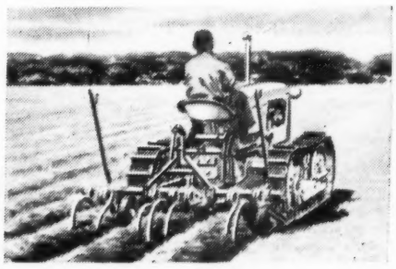

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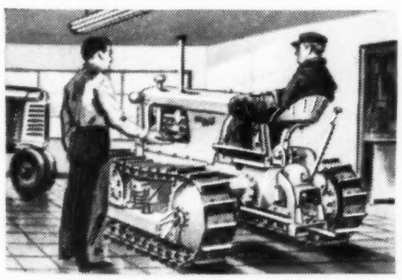

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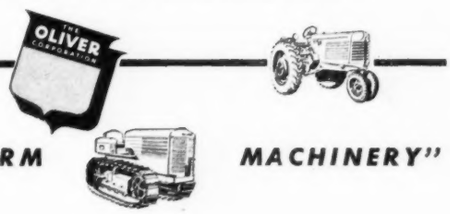

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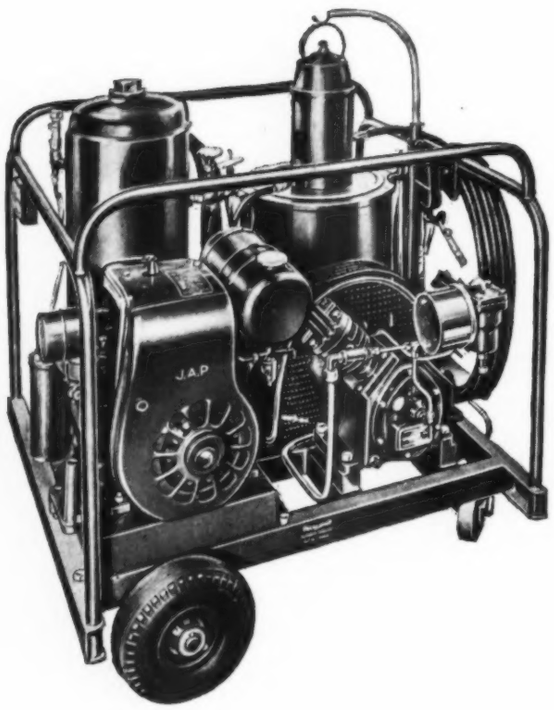

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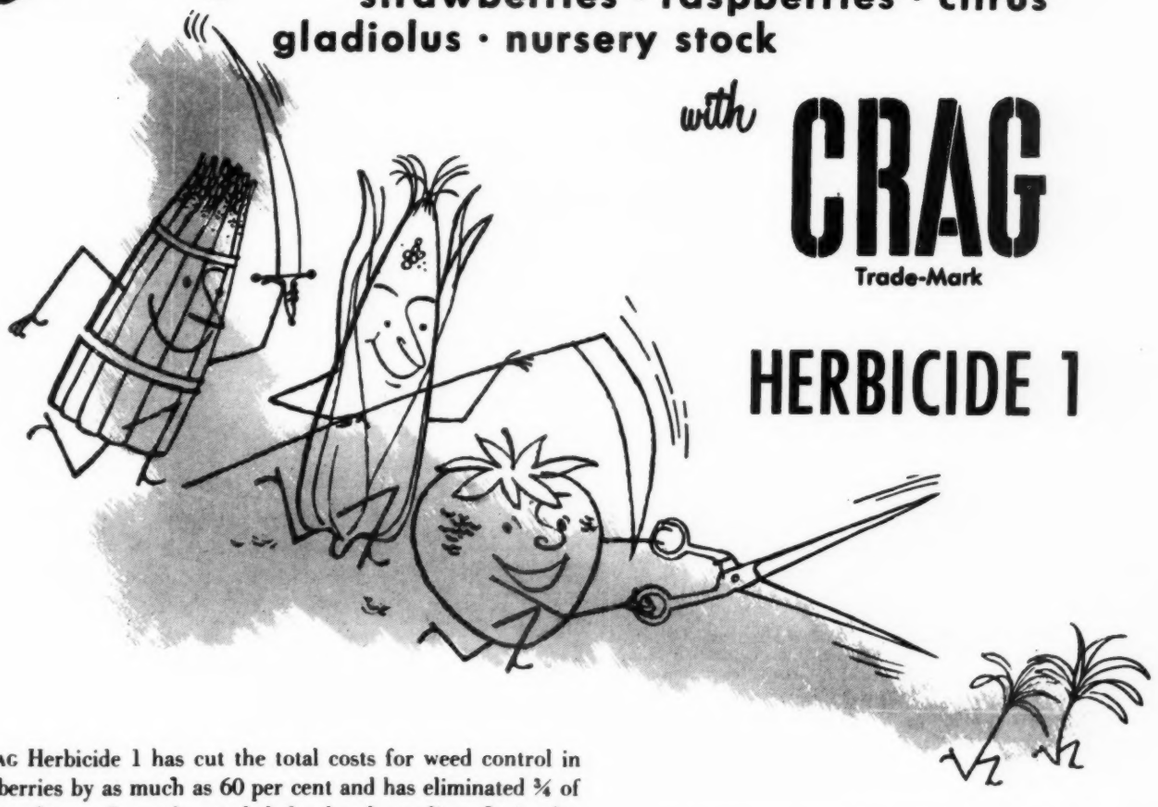

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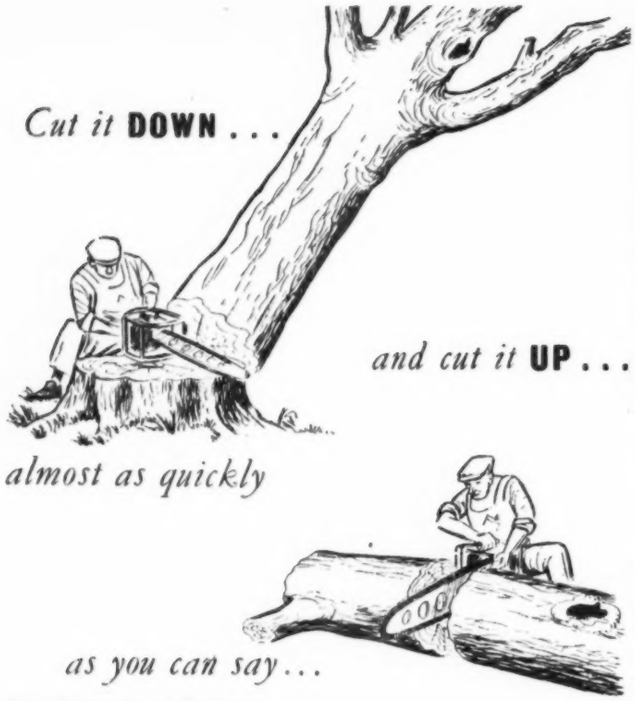

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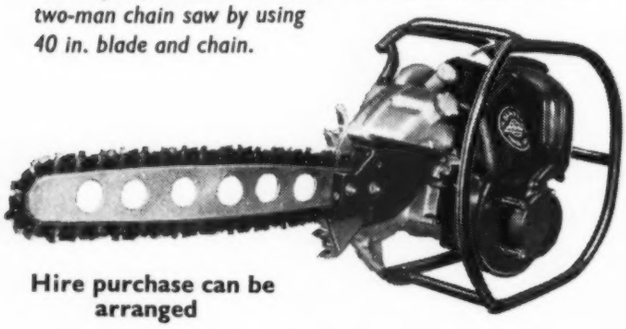

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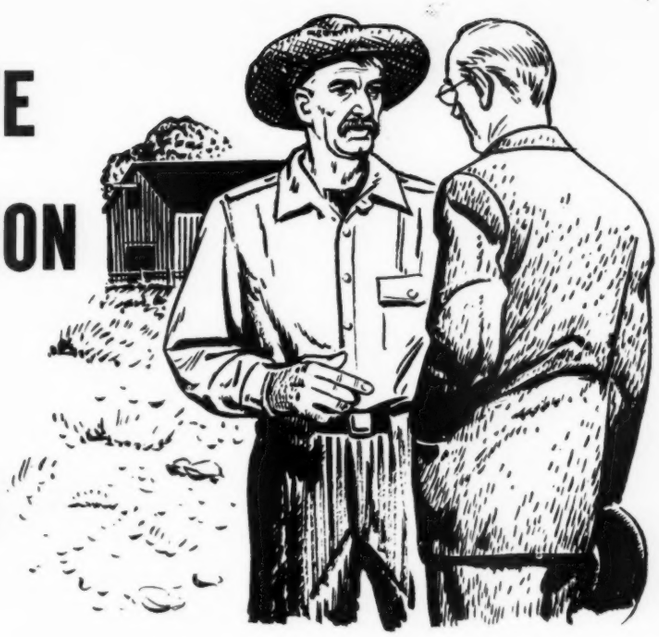

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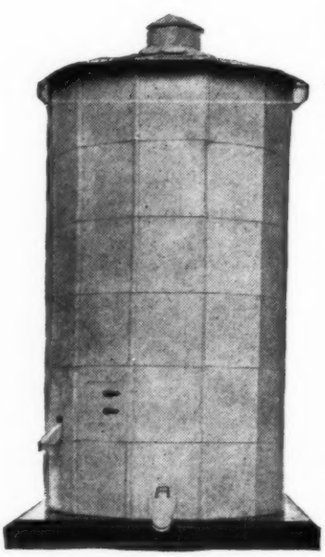

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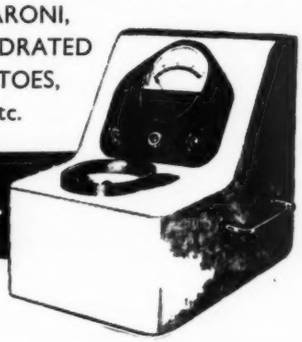

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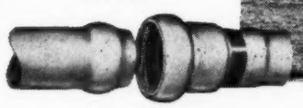

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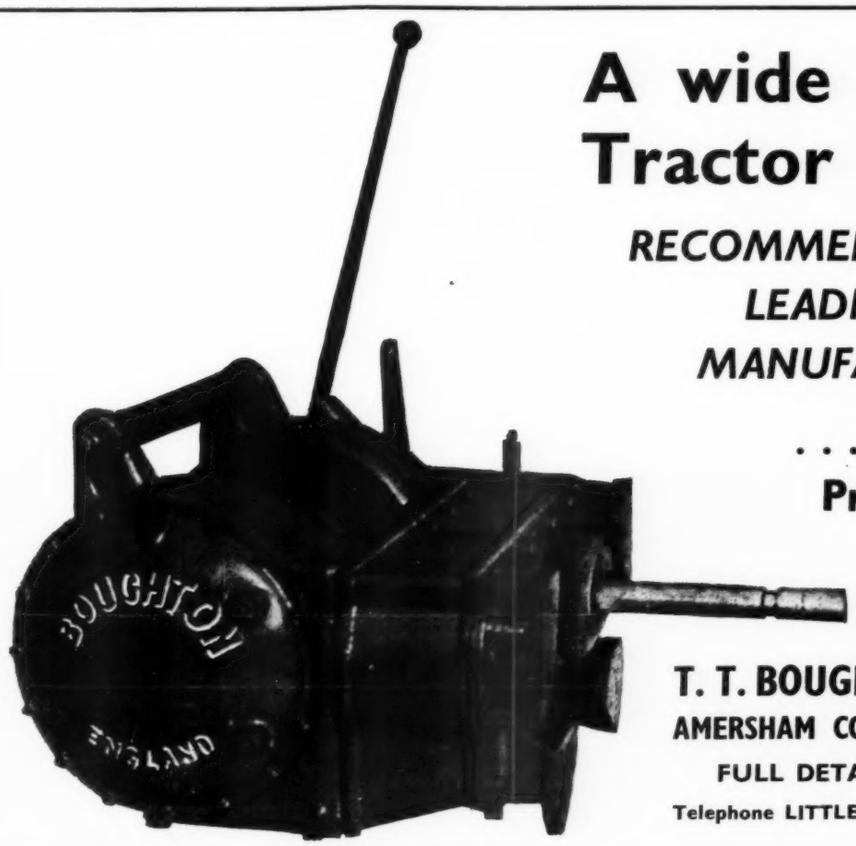

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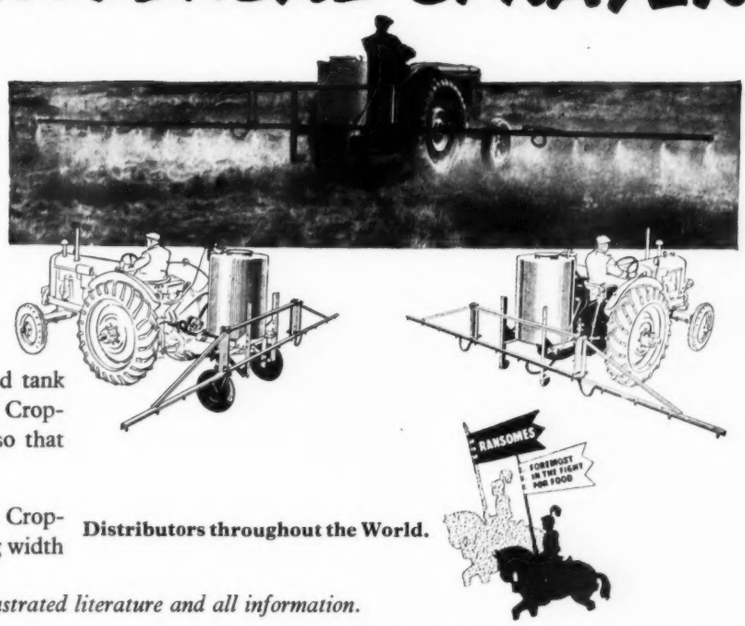

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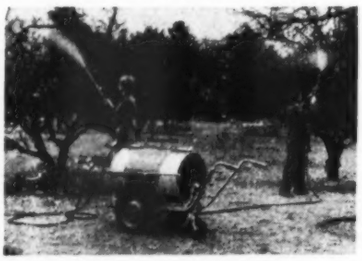

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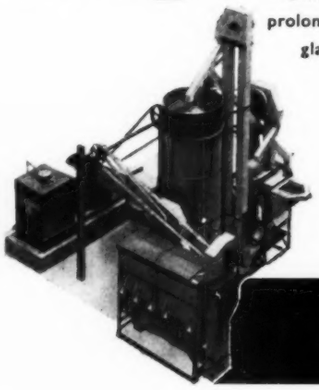

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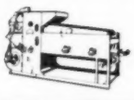

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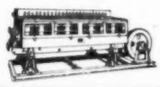

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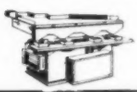

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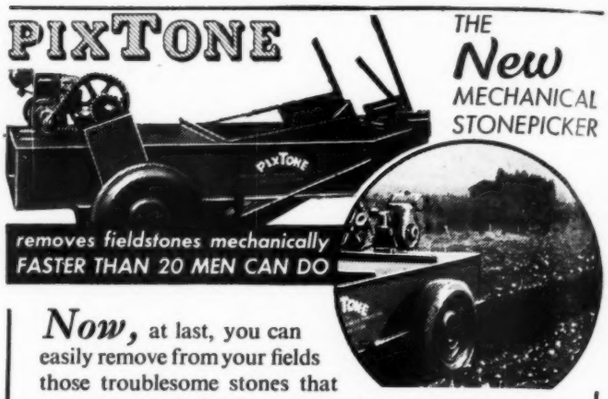

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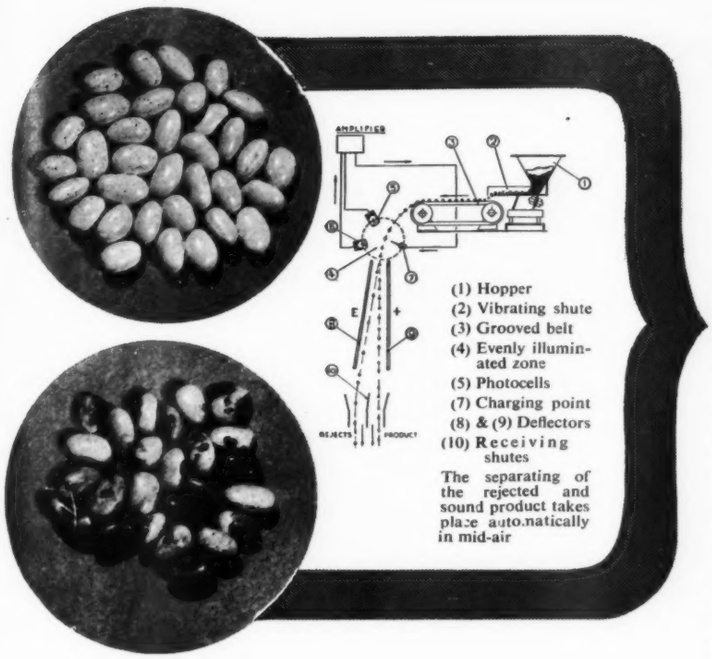

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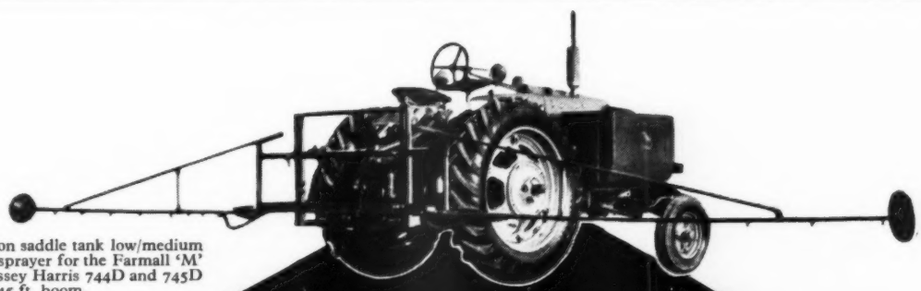

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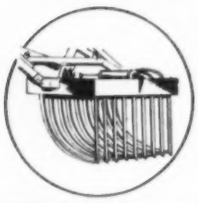

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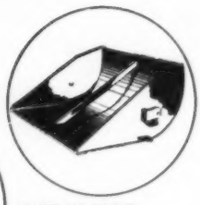

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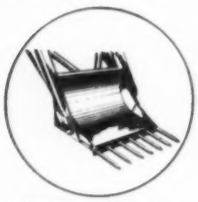

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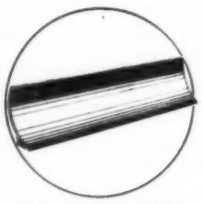

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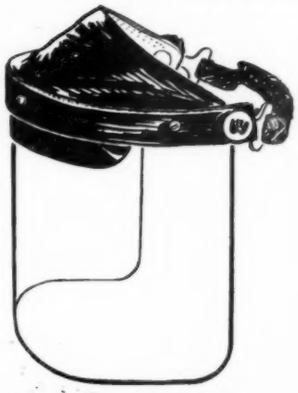

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